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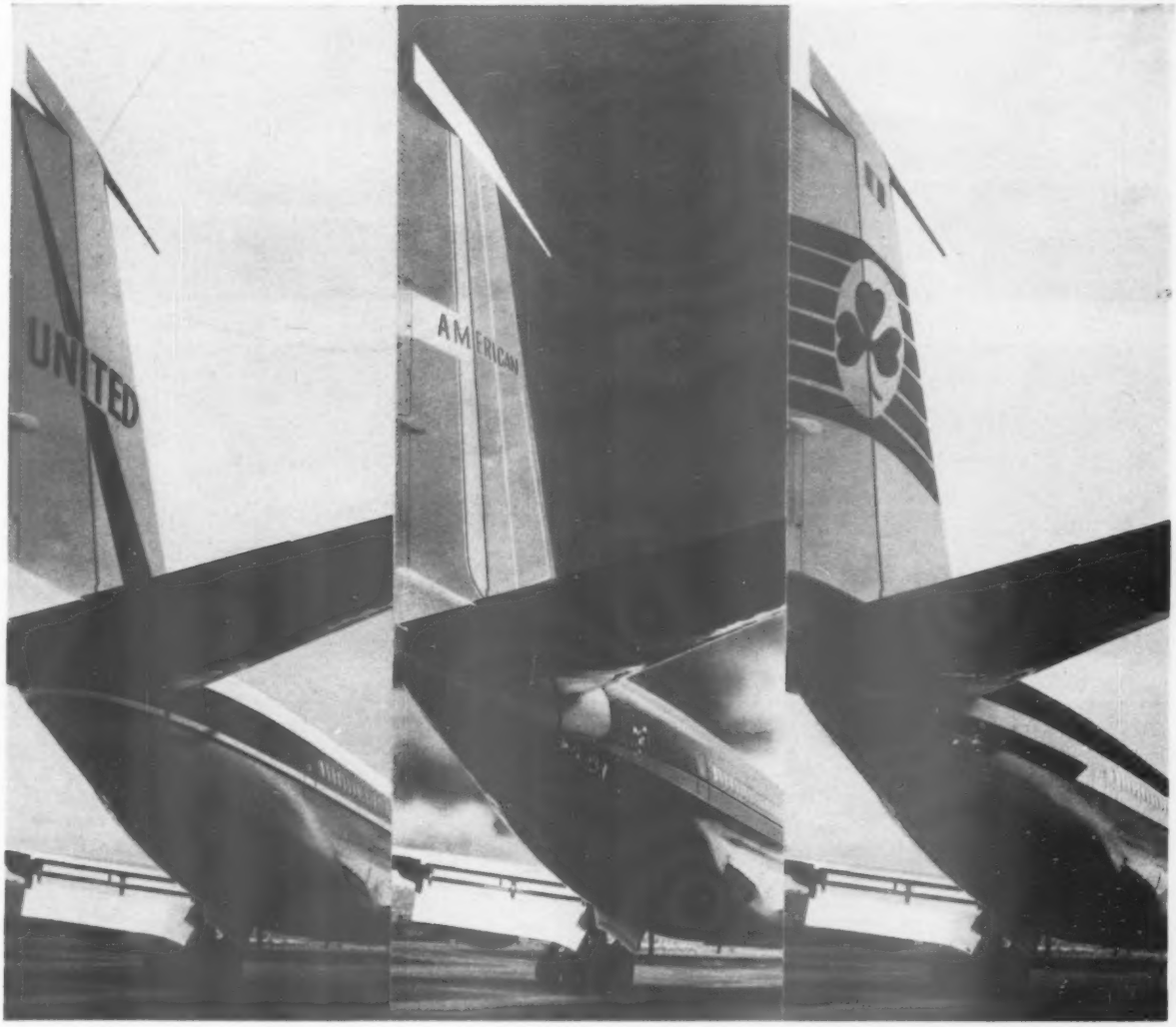

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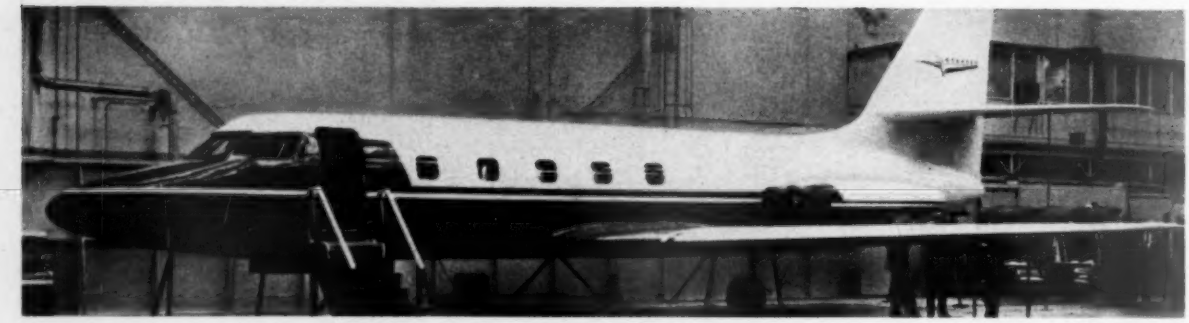
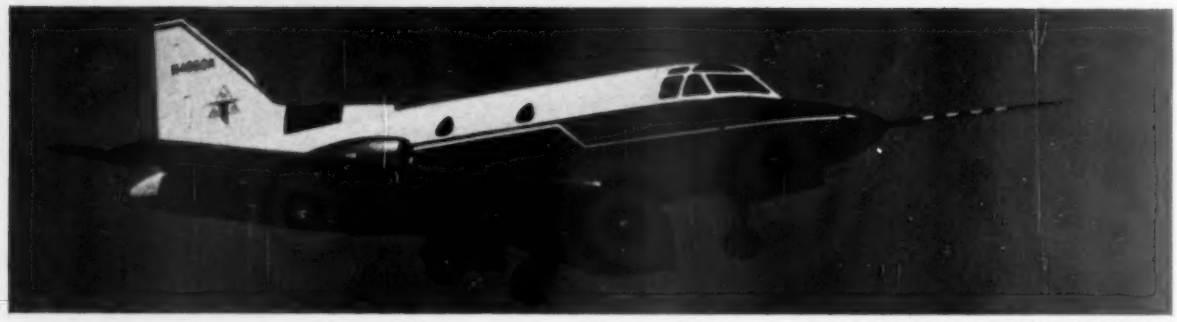


LOCKHEED JETSTAR

McDONNELL M119



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THE AEROPLANE and ASTRONAUTICS

VOLUME 96 NUMBER 2491 MAY 29, 1959

Air Bridge to Moscow

Now that regular scheduled services are running between London and Moscow there will undoubtedly be a great deal of discussion among English visitors when they get home about the state of affairs in the Soviet Union. What, it may be asked, will impress them most? Among those who went on the recent inaugural trips by B.E.A. to the Russian capital there seems to have been complete agreement on certain points, first the determination of the Russian authorities that their English visitors should be allowed to inform themselves about anything they wished relating to the opening up of the new air services, and second the friendliness of the bulk of the Muscovite population in spite of the language difficulty, enhanced as it is by a strange alphabet.

There has been considerable uncertainty about the exact state of Russian civil aviation and indeed many people are disposed to think of it as being behind the times. We do not believe that anyone who has seen the vastness of the building and rehousing operations in Moscow can have any doubt of Russia's capability to get things done, and done quickly. Thus, however much civil aviation operating procedures in Russia at this moment may seem to be behind European standards, there can be no doubt that enough capacity will be forthcoming in the very near future to overcome such discrepancies. That they intend to use the best possible equipment is demonstrated by the order for two Pye instrument landing systems for Vnukovo Airport, Moscow, and the decision to evaluate the Decca Flight Log which we reported last week. The choice of Decca would be a natural one since B.E.A. uses it and both national operators would find a chain or chains as valuable in the Moscow area as in the London area and on the north European airways.

No startlingly new aeroplanes were on show to the visitors who were invited to inspect the Tu-104, the Il-18 and the An-10, all of which were illustrated and described in our commercial aviation number of July 4 last year. The An-10 is still under development and the specimen on show was obviously being worked very hard. The new very large turboprop, the Tu-114, is scheduled to go into airline service in October. No doubt it will be tried out on the internal airlines, just as is happening with the Il-18, until Aeroflot is satisfied that this 400,000 lb. giant will do credit to all concerned on international routes.

Another question that a visit to Moscow helps to answer concerns the amount of traffic between the two centres for so long unlinked. Both the Aeroflot and B.E.A. executives are optimistic, and it seems with good reason. Some Russians expressed the view that the present double twice-weekly services would soon rise to six.

If present facts mean anything, they point this way. Already the B.E.A. manager in Moscow is having to put off freight to make room for passengers. This, incidentally, disposes of the canard that B.E.A. are disappointed with the freight being offered them.

There is plenty to keep the tourist occupied and interested in Moscow. It is also a centre whence journeys of exploration can be made. Holiday resorts on the Black Sea coast are already being

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written about in the Sunday newspapers. Trade and business is improving steadily. In such circumstances the air bridge built by the two Marshals, Douglas and Zhigarev, seems likely to carry much traffic.

Speeding Up Communications

Fifty years ago, on July 25, 1909, the Frenchman Louis Blériot flew across the English Channel to win the prize of £1,000 offered by the *Daily Mail*, and thereby created history in being the first man to cross the Channel by aeroplane. Fifty years later the same paper, in the same spirit of encouraging enterprise in the air, offers three prizes of £5,000, £2,500 and £1,500, and in addition, a special £1,000 prize for the most praiseworthy attempt in a competition to achieve the fastest time between Marble Arch, London, and the Arc de Triumphe, Paris, or *vice versa*. These £10,000 worth of prizes are offered to the competitors of any nationality who shall succeed in making the single journey either way in the shortest times.

When THE AEROPLANE, as it then was, sponsored the famous "Hare and Tortoise" operation in 1948, two helicopters (one Bristol and one Westland) and a Gloster Meteor were used to carry a message from the Lord Mayor of London to the president of the Paris municipal council. The air journeys began at St. Paul's and ended at Les Invalides. The time as certified by the Royal Aero Club, who once again will be responsible for the timekeeping, was 46 min. 44½ sec. It took Blériot 37 minutes to fly from Les Baraques to Dover.

The "Hare and Tortoise" figure does not have to be beaten to win the *Daily Mail* prize, but it is a measure of what could be done eleven years ago. And, moreover, it was planned to take place on a specific day, which it did.

The new attempt opens some exciting possibilities. The idea is to have the timekeepers' stations as close to the starting and finishing places as practicable. Here the competitors will get their cards time-stamped. One can imagine the excitement should it prove practicable to perform this function attached by line to a helicopter hovering overhead.

The competition will be open from July 14 to July 23 inclusive and will be organized in association with the Royal Aero Club. The journey must be made between 08.00 and 21.00 hrs. Competitors may travel in either direction and may make as many attempts as they wish.

The "race" will be open to competitors of any nationality and those competing may use "any combination of any number of types of vehicles to make the journey." It will be interesting to see just what combinations of vehicles come to be used and how many attempts there will be to arrange a "single-vehicle" trip by rotary-wing craft, such as the high-cruising-speed Fairey Rotodyne. If special permission could be obtained to fly out of Hyde Park, the use of a STOL aircraft such as a Twin Pioneer might have interesting possibilities.

In the stated rules it is made plain that nothing is to be barred provided that the competitors do not transgress the laws and regulations of the countries through which they pass or over which they fly. They must, however, be responsible for obtaining any permits required and for arranging necessary facilities such as the attendance of Customs officials at the points of departure and arrival.

The question arises whether parachuting will be allowed. This could simplify things at the finishing end considerably. Once safely down, the competitor could be whisked off to the time-keeper by motorcycle. Such expedients would certainly add to the fun and no doubt to the excitement.

The winning times are likely to demonstrate the need for the best brains of all countries to concentrate on the problem of how to reduce transit times between airport and city centre. This was the basic idea behind our own "Hare and Tortoise" enterprise. On that occasion the Lord Mayor's letter was conveyed from London to Paris in no more time than an airline coach takes to link London's airport with the airline terminal. If the *Daily Mail*'s latest aerocompetition succeeds in focusing attention on the intolerable delays which hamper the air traveller on the ground, international aviation will be very much in its debt.

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AEROFLOT PRESENTATION.—During his recent visit to this country, Marshal Zhigarev presented B.E.A. with a gift from Aeroflot; it was in the form of a modelled bison. Here Mr. A. H. Millward, B.E.A.'s chief executive (left) receives the gift at London Airport.

Backwards, Forwards or Sideways?

Among the problems which will be encountered in developing the supersonic transport aircraft is what to do with the passenger cabin. Several factors are likely to circumscribe choice of cabin arrangements, including the aerodynamic requirement for a long, slender fuselage, and the operating requirement for rapid climbs and descents. How best to fill a narrow, probably windowless, tube which will spend as much as 15 minutes at a time tilted nose-up or nose-down at angles of 10-12° from horizontal?

It is unlikely that the airlines will be able to feature five- or six-abreast seating in these new aeroplanes. Indeed, some layouts already studied on the other side of the Atlantic feature a single row of seats each side of a central aisle, while "backs-to-the-wall" seating is also being considered. To reduce the effects of claustrophobia, a closed-circuit TV presentation of the outside vista could be easily arranged—but would probably be dreary to look at. So we may yet have pre-recorded TV programmes piped to individual viewing screens at each seat—complete with "commercials."

Supersonic journeys will be short, so lower standards of comfort and of cabin service could be justified. On the other hand, these new £10 million transports—when they come—will have connotations of prestige and luxury which will make the interior decorator's job still more difficult.

It is indicative of the vigour with which supersonic transport design is being pursued in the U.S.A. that industrial designers are already giving special attention to cabin layouts. Mr. Henry Dreyfus, for instance, who was in London last week, has been retained by Lockheed and is making a precise study of passenger requirements on a two-hour supersonic journey. Where, in Britain, is equally serious attention being given to these particular aspects of supersonic air travel?

Matters of Moment

An Astronautical Programme

SO great is the interest surrounding the 1st Commonwealth Spaceflight Symposium which the British Interplanetary Society is to hold at Church House, Westminster, in August, that the proceedings have had to be extended an extra day. The dates of the meeting are now August 27-29.

In addition to Commonwealth speakers, support from the British aircraft, missile and associated industries is such that it has been difficult to fit in all the papers submitted. Contributions cover a wide field, ranging from the economics of various hypothetical space-programmes to the adaptation of available military missiles as satellite launchers, and the problems of tracking and communication.

The programme includes the following papers:—

"Britain's Place in Interplanetary Exploration," by J. E. Allen (A. V. Roe and Co., Ltd.); "The Recovery of Earth-Satellites," by Dr. D. E. Bailey (A. V. Roe and Co., Ltd.); "Heating Problems of Re-entry Into Planetary Atmospheres," by Dr. D. J. Shapland (A. V. Roe and Co., Ltd.); "Space Navigation," by P. R. Wyke (A. V. Roe and Co., Ltd.); "Astronautics at Armstrong Whitworths," by H. R. Watson (Sir W. G. Armstrong Whitworth Aircraft, Ltd.); "Altitude Sounding by Solid Propellent Rockets and its Economics," by W. T. Fisher (Bristol Aerojet, Ltd.); "General Review of a British Space-Flight Project Based on Blue Streak," by G. K. C. Pardoe (de Havilland Propellers, Ltd.); "The Jodrell Bank Radio Telescope as a Space Communicator," by J. H. Thomson (Jodrell Bank Experimental Station); "Instrumentation for Space-Flight," by P. V. Somes-Charlton, Dr. L. Lax and Dr. P. Barratt (Pye, Ltd.); "Data from Satellite Orbits," by Dr. G. V. Groves (University College); "The Economics of Space-Flight," by Derek Wragge Morely (*Financial Times*); "Economic Considerations of Space-Research," by Prof. T. Hutchappa (Indian Astronautical Society); "Cabin Conditioning Equipment for a Manned Satellite," by G. Beardshall and P. Fitt (Normalair, Ltd.); "Satellite Tracking by Optical Methods," by Dr. A. P. Willmore (University College).

A number of further papers, mainly from Commonwealth sources, have yet to be finalized.

In addition to the lecture sessions, arrangements are being made to hold a small Astronautical Exhibition at Church House during the Symposium and throughout the 10th Congress of the International Astronautical Federation, which follows at the same venue from August 31 to September 5.

Admission to the Commonwealth Spaceflight Symposium is by ticket only, and those wishing to attend are advised to make early application to the secretary, British Interplanetary Society, 12 Bessborough Gardens, London, S.W.1.

New Engines by Bristol Siddeley

INDICATIONS of future engine developments have been given by Sir Reginald Verdon Smith in the sections of his recent annual chairman's report which survey the work of Bristol Aero-Engines, Ltd.—now merged to form part of Bristol Siddeley Engines. He revealed the existence of a new turbo-fan engine suitable for VTOL and STOL aircraft which has been under development "for some time past" with the support of the Mutual Weapons Development Programme organization. To quote the report, "this type leads on to a new generation of ducted-fan engines for conventional aircraft which shows great promise in power/weight ratios and fuel economy."

The turbo-fan engine being developed with M.W.D.P. financial backing is doubtless in the running as the powerplant for future NATO fighters. This would be a logical extension of present plans; Bristol Orpheus engines power both the current NATO light fighter, the Fiat G.91, and the second-generation aircraft in the NATO series, the Breguet Taon.

This new powerplant bears a certain relationship to the Orpheus and is a logical choice for a third-generation NATO fighter, which would use VTOL techniques. Only one project in this category has so far been discussed openly; a Hawker VTOL fighter. [THE AEROPLANE, June 6, 1958.]

Another likely application for the new turbo-fan engine—or a variant of it—is the Bristol 205 medium-range jet airliner.

The present position of Bristol Aerojet, Ltd., was also mentioned by the chairman. This company was formed to develop and produce solid-rocket motors and propellents, including those based on polyurethane. The company is to be jointly owned by Bristol and Aerojet, but remains at present a wholly owned Bristol subsidiary, as negotiations are still proceeding between the British and U.S. Governments for the exchange of relevant classified information.

Bristol Aerojet could well become a key company in future. In the U.S. second-generation ballistic missiles use solid rather than liquid propellents. If Britain were also to develop advanced long-range missiles with solid propellents, Bristol Aerojet would be in a good position to produce their motors.

NIGHT DEFENCE.—Javelins of No. 64 Squadron, stationed at Duxford, in an imposing formation. More about Duxford and its squadrons appears on pages 621 to 625.

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ALVIS VISIT.—Foreign military and air attachés watch the assembly of an Alvis Leonides engine (top) at Coventry on May 21. Among Leonides-engined aircraft demonstrated to the guests at Baginton (bottom) were a de Havilland Beaver 2, a Hunting Percival Prince and a Scottish Aviation Pioneer.

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Matters of Moment . . . .

Diversification at Alvis

TWENTY-THREE foreign military and air attachés based in London visited the factory of Alvis, Ltd., at Coventry, on May 21, and watched a demonstration of the company's products at Baginton aerodrome. As the demonstration indicated, less than half the Alvis' efforts are now devoted to aircraft engines; armoured fighting vehicles account for 45% of its output, aircraft engines for another 45% and motorcars for 10%.

During the visit to the factory, Leonides engines were seen both in production and under overhaul. Three Leonides variants were in evidence—the 875-b.h.p. twin-row Leonides Major, the 560-b.h.p. Leonides and the long-stroke Leonides 530 of 625 b.h.p. These engines are used in a range of fixed-wing aircraft and helicopters, although since the apparent demise of the piston-engined Handley Page Herald the only application of the Leonides Major is in the Westland Whirlwind helicopter. Current overhaul lives are 250 hr. for the Major; 1,000 hr. for the single-row Leonides and 800 hr. for the long-stroke engine.

At Baginton aerodrome flight demonstrations were given by five Alvis-engined aircraft—a Hunting Provost and Prince, a de Havilland Beaver, and a Scottish Aviation Pioneer and Twin Pioneer. Another demonstration of aeronautical interest was given by a Pyrene Mk. 6 airfield crash tender, a fire-fighting vehicle built on the six-wheeled Alvis chassis known as the Salamander. This vehicle showed its ability to smother a fire with foam, which can be discharged at 5,000 gal./min. from a nozzle mounted on the vehicle and two fire hoses. The R.A.F. has 41 of these crash tenders and the R.C.A.F. 34.

An Award from Russia

FOR the first time Russia's Academy of Sciences has awarded their A. S. Popov's Gold Medal to a scientist outside the Soviet Union. This signal honour goes to Dr. Louis Essen, a senior principal scientific officer of the National Physical Laboratory at Teddington. It has been awarded for "the most distinguished scientific work in the field of radio-engineering performed during the period from 1956 to 1958."

According to the announcement, the outstanding achievement for which Dr. Essen has received the award has been his work leading to the establishment of an atomic frequency standard as a possible basis for the future standard of time. This would have greater precision and be more easily accessible than the astronomical standard, for the purposes of radio engineering and physics.

Dr. Essen has also played a leading part in establishing that the precision of the cæsium standard and the stability of propagation of low-frequency radio waves meet the demands of improved aerial navigation systems which require times and frequencies to be compared over very long distances with great accuracy. For this work he recently received the first Wolfe Award. He has been at the N.P.L. since 1929.

Celebrations at Duxford

A QUARTER of a century of enthusiastic devotion to the tasks in hand was celebrated with matching enthusiasm last week when CIBA (A.R.L.), Ltd., held their 25th birthday party at Duxford. It was also the occasion of the formal opening of their new Araldite plant and a new research laboratory by Dr. R. Käppeli, chairman of the parent organization.

Initially known as Aero Research, Ltd., and for the past 12 years a member of the CIBA organization at Basle, this remarkable company has built up an enviable reputation as a specialist in synthetic adhesives for bonding all sorts of materials to themselves and to each other. Names like Redux, Araldite and Aerolite have become "household" words in the aircraft and many other industries. The fact that it now exports more than £1 million worth of its products every year is a measure of its growth in stature and responsibility during the quarter of a century since its founding.

The occasion on May 21 was one of those happy affairs that was more in the nature of a gathering of old friends rather than a company celebration. The aircraft industry, science and politics were fully represented among the large and distinguished company of guests which included, too, the Swiss Ambassador. All joined in congratulating the company and its founder, Dr. N. A. de Bruyne, on their achievements and in wishing them well for the future.

The celebrations were, however, tinged with regret for Dr. de Bruyne in his after-dinner speech announced that he did not propose to offer himself for re-election as managing director in 1961—although he would be prepared to stay on the board. He felt, he explained, that the time had come for him to do some of the other things he wanted to do in the realm of science. Although he would give no hint of his plans it is certainly to be hoped that the aeronautical scene will not be entirely deprived of his stimulating presence.

As SIR ARTHUR VERE HARVEY, the company's chairman, said in welcoming the guests, the anniversary of the company was really Dr. de Bruyne's day. One of his great qualities was his capacity for building up around him a first-class team of young enthusiasts.

Following a custom in the CIBA group, Sir Arthur presented both Dr. de Bruyne and Mr. G. S. Newell—who had been with him since the beginning—with gold watches.

DR. KAPPELI also spoke warmly of the founder of the company and his talent for guiding a team of co-workers and creating an atmosphere in which all were happy. He referred to his announced retirement from his post as managing director as a matter that was anything but pleasant.

In his own speech DR. DE BRUYNE added his welcome to the guests and referred to his many friends who had helped him to build Aero Research into the company it had become. He had some nice things to say about the technical Press in this country; and generously attributed a measure of his success to an article which had appeared in THE AEROPLANE in the early days of his work. He summarized the lessons learned by his team from the past as that there was no substitute for work one enjoys and that when they failed it was often because they were not courageous enough.

Dr. de Bruyne spoke about research—on which his company were now spending "a great deal of money." He expressed his conviction that industry must do its own research. The greatest help the Government could give in this direction was to make it as easy as possible for industry to do this.

He paid a tribute to the CIBA company for the help that A.R.L. had received from it. It was, he said, a most successful international co-operation between men of two nations who had many things in common.

During the course of the celebrations, the guests were given the opportunity of inspecting the factory both in the normal way and from the air in a B.E.A. Whirlwind helicopter. Both these "tours" brought home the fact that the CIBA (A.R.L.) plant is a most pleasant and attractive place—the result of a careful combination of a functional layout and contemporary architecture. Its cleanliness is remarkable and the enthusiasm of its occupants very self-evident. All the signs seem to augur well for the company's next 25 years to complete their half-century.—F.T.M.

Air Transport

Europair in Action

AT the two-day meeting in Paris last week the four remaining partners in the Europair project—Air France, Alitalia, Lufthansa and Sabena—appear to have reached general agreement on the principles to be followed and have decided to continue to go ahead with a programme of co-operation. A provisional secretariat is to be set up in Paris and permanent committees are to be appointed.

It appears that this general agreement covers the question of the different operators' share in the traffic and organization—a question which caused K.L.M. to drop out of the meetings at the end of April. For the rest, the progress of the talks and the order of precedence for the areas where co-operation will be started continue to be the subject of inspired deductions rather than of hard reporting. As we suggested in the issue of May 1—when we commented at some length (p. 512) on the Europair programme and likely aims—it is probable that the first efforts will be directed at the rationalization of the carriers' turbojet and other North Atlantic operations.

There is nothing particularly new about the idea of traffic pooling and service co-ordination—the importance of Europair depends more on possible future developments in the way of technical sales and traffic-handling rationalization leading, perhaps, to a consolidation as complete as that when S.A.S. was formed after the War from D.D.L. (Denmark), D.N.L. (Norway) and A.B.A. (Sweden). Last year S.A.S. entered into a fleet-use and engineering agreement with Swissair.

The 400th Viscount

AT a brief ceremony at Wisley Airfield today (May 29) the 400th Viscount is to be handed over to Mr. P. Ll. Hunting, chairman of the Hunting Group of Companies, by Sir George Edwards, managing director of Vickers-Armstrongs (Aircraft), Ltd. The aircraft, a V.833, is the first of three which Hunting-Clan Air Transport will use, primarily on their Safari services.

Among the new features of this series of Viscount are the Rolls-Royce Dart 530 engines; these have a take-off rating of 2,105 e.h.p. compared with the 1,990 e.h.p. of the Dart 525s in other Viscount 810s. The first Viscount 833 will leave shortly on a 10-day route-proving flight to Kenya including tropical trials for the Dart 530 at Khartoum and Nairobi.

Charles Butler Associates were retained by Hunting-Clan to style the cabin and design the interior fitments for the V.833. The interior is furnished in varied warm tones of rose; contrasting with this is the seat covering of rich blue, incorporating flecks of gold which is picked up by other gold accents on trim moulding, window surrounds and decorative plastics, giving an interior with an elegant and distinctive atmosphere.

Opposite the main passenger door forward, coat hanging space is provided; the twin galley units, on each side of the centre aisle, are also forward of the passenger cabin. Up to 69 tourist-class passengers are carried in 13 rows of five abreast seats, and one row four abreast. Two bar units and two toilets are situated to the rear of the passenger cabin. All interior fitments are removable and were manufactured and installed by Field Aircraft Services, a company in the Hunting Group.

The cockpit is laid out for pilot, co-pilot, and radio operator. The comprehensive radio installation includes VHF, HF, and the new Marconi 712 ADF, also chosen for the Vanguard. Navigational aids include Bendix X-band (ground mapping), nose-mounted radar, with provision for drift measurement, and a periscopic sextant.

B.E.A.'s Better April

AS the figures in the table show, B.E.A. carried about 17% more passengers during April than in the same period of 1958 and freight ton-miles showed a spectacular increase of 33%. The table also shows that the increases have been achieved against a sizeable reduction in aircraft hours flown.

	April, 1959	April, 1958	Variation (%)
Capacity ton-miles offered ..	14,454,000	13,798,000	+ 4.8
Load ton-miles sold ..	9,502,000	7,777,000	+22.2
Revenue load factor (%) ..	65.7	56.4	+16.5
Passengers carried ..	241,000	205,700	+17.2
Passenger-miles flown ..	85,013,000	70,919,000	+19.9
Passenger load factor (%) ..	67.2	58.8	+14.2
Freight ton-miles ..	1,129,100	849,600	+32.9
Mail ton-miles	329,700	279,900	+17.8
Aircraft miles flown ..	2,787,000	2,787,000	—
Revenue hours flown ..	14,389	15,453	— 6.9

One of the more significant developments during the past six years has been the increase in average aircraft utilization. The Viscount 701 fleet, for instance, is now averaging nearly 2,500 hours per aircraft per annum and the inter-overhaul life of the Dart 506s is 2,300 hr. The newer Viscount 802s are averaging a figure of more than 2,000 hr.p.a. and even the 806s, which have been in service for less than 17 months, have also now reached a utilization average of 2,000 hr.p.a. and their Dart 520s have a life of 1,500 hr.

Comets—New and Old

AEROLINEAS Argentinas started to operate a twice-weekly Comet service between Buenos Aires and London on May 19. The aircraft left L.A.P. for Buenos Aires after a 3½-hour turn-round on May 20.

Following the opening of the Santiago de Chile service on April 16 and the New York service which is due to start today, May 29, Aerolineas can claim a triple first in the way of turbojet services.

The 11th Comet 4 for B.O.A.C. was delivered on May 14 and two more (G-APDN from Hatfield and G-APDP from Chester) should be out this week.

This week, too, the Avon-engined prototype Comet 2X (G-ALYT) was due, wind and weather permitting, to take the air again on its final flight—from Hatfield to R.A.F. Halton, where it is to be used for technical training. Halton's little aerodrome offers a maximum grass run of about 3,900 ft. Gp. Capt. John Cunningham was due to take the 2X over on or about May 28 subject to a suitable wind direction and to dry conditions so that there will be reasonable braking on the grass surface.

BRANCHLINER TOUR.—The Dart Herald—seen here on the apron at Mehrabad Airport, Teheran—returned on May 21 from its 18,500-mile sales tour of India, Pakistan and the Middle East, during which there were only two short hold-ups, one because of a weather diversion and one the result of minor technical trouble. A note on the Herald's north-west frontier flying in India appeared on page 565 of our issue of May 15.

Air Transport . . . .

Looking After the Tu-104

REFUELLING of the Aeroflot Tu-104As at London is being handled by Shell-Mex and B.P., the marketing company associated with Air B.P. Similar arrangements with Aeroflot have been made at Copenhagen and Brussels by Air B.P., from whom we have obtained the following details of the Tu-104A fuel system.

The aircraft has a total of seven groups of flexible bag-type tanks, one in the centre-section of the fuselage and three in each wing-half outboard of the engines. Tanks of each group are interconnected and are gravity-filled through three single 1¼-in. intakes in the top of each wing-half, and two intakes close to the fuselage side above the engine intakes.

The fuselage group, which is regarded as a long-range tank for optional use, is in two parts, with a total capacity of 10,600 litres (venting problems prevent 300 litres of this from being used). The wing-tank groups, reading outwards from the centre, have capacities, respectively, of 6,275 litres, 3,125 litres and 2,025 litres in each wing, so the total usable capacity of the Tu-104A is 33,150 litres (7,292 Imp. gallons).

For refuelling, an 8-micron filter is specified. Defuelling is possible through the outlets at the wing tips and, for fuel dumping in flight, there are four additional ports with telescopic extensions in the undersides of the wings. Standard kerosene (ATK) is supplied for the Tu-104A at London Airport.

A Good Record

B.O.A.C. reports itself quite well pleased with the Comet's record of punctuality in the first six months of service. Out of 309 services operated (on the difficult North Atlantic route between London and New York) 92, or 30%, arrived on time and another 132, or 41%, were not more than one hour late. Ten services (3%) were more than 12 hours late.

In air transport, punctuality is one of the most important yardsticks by which the passenger judges an airline's efficiency. It is also one of the most difficult things to control, especially in the first few months of service with a new type of aircraft, operating over long stages. In the case of the Comet, an appreciably better standard of punctuality has been established than with other types introduced by B.O.A.C. in recent years.

In the tables shown, the Comet is compared with two other types which B.O.A.C. has introduced on its North Atlantic services in recent years. Each type went into service at approximately the same time of the year, and the statistics relate to the first six months of operation. The tables show, first, the punctuality of the aircraft at terminal point; secondly, the causes of delay under five broad headings; and thirdly, a break-down of engineering delays into three categories.

Taken overall, the DC-7C enjoyed the best record of punctuality, but the Comet was only marginally worse. In all cases, weather was the most frequent cause of delays, the six-month period concerned being in the winter season. The Comet delays due to weather were also influenced by the abnormally foggy conditions in the 1958-59 winter. The greater range of the DC-7C made it less dependent upon favourable weather at refuelling stops.

Although the delays experienced by the Britannia 312 were more serious than with the other two aircraft, largely through engineering difficulties, it is worth noting that one extra factor in the case of this type was that of last-minute adjustments to the flight plan in order to secure the greatest chance of a non-stop crossing. This factor led to the higher frequency of operational delays shown in the table, this in turn influencing the consequential delays.

One of the most encouraging features of the Comet operations so far is the overall engineering delay record. Of the total of 50 engineering delays, 19 were of less than an hour and only two were over 12 hours. Radio accounted for most delays—11 in all—but the ground and miscellaneous equipment group was the worst offender in terms of time, accounting for 26¾ hours, or just over 25% of the total engineering delay time. Powerplants gave rise to only seven delays, including five fire-extinguisher system defects. The most common causes of aircraft system delays—electrical, hydraulic, fuel and pressurization—have not, so far, been encountered on the Comet to any great degree.

TERMINAL ARRIVAL PUNCTUALITY

PUNCTUALITY CRITERIA	DC-7C	COMET 4	BRITANNIA 312
On time or Early	43%	33%	25%
Within 1 hour	75%	71%	47%
Within 6 hours	95%	95%	91%
Within 12 hours	96%	97%	95%

CAUSES OF UNPUNCTUALITY

CAUSE OF DELAY	DC-7C		COMET 4		BRITANNIA 312	
	Frequency Rate (1)	Duration Rate (2)	Frequency Rate (1)	Duration Rate (2)	Frequency Rate (1)	Duration Rate (2)
Engineering ..	7.5	2.9	10.4	3.7	27.7	9.7
Weather	38.0	5.0	48.4	11.3	44.1	4.8
Operations ..	10.9	2.2	13.8	1.0	23.4	4.4
Traffic	22.6	0.9	12.7	0.5	26.0	1.1
Consequential ..	1.2	1.4	1.7	2.6	2.1	3.2
TOTALS	80.2	12.4	87.0	19.1	123.3	23.2

BREAK-DOWN OF ENGINEERING DELAYS

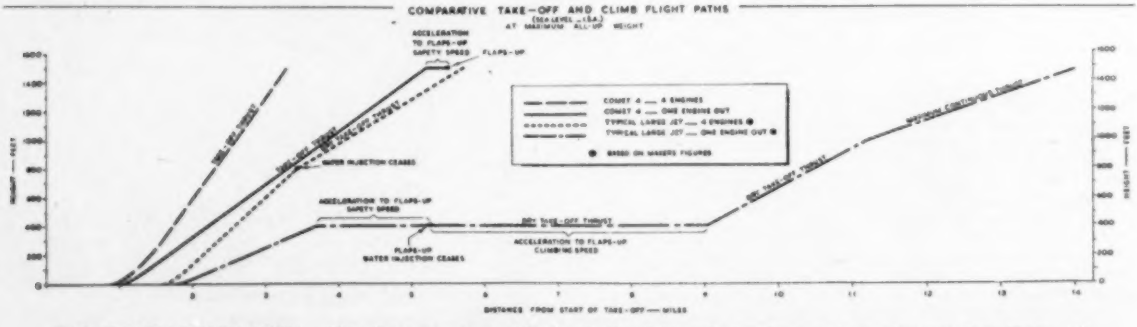
Powerplant and associated Systems	2.9	1.3	1.4	0.5	2.1	1.2
Aircraft Systems	3.9	1.5	7.8	2.2	19.7	5.5
Ground Equipment ..	0.7	0.1	1.2	1.0	5.9	3.0

(1) Frequency Rate = No. of delays per 100 take-offs.
(2) Duration Rate = Length of delay (hours) per 100 hours of Scheduled Elapsed (i.e., Timetable) Time.

A comparison of DC-7C, Comet 4 and Britannia 312 punctuality. The lower table amplifies, under the same headings, the engineering delay figures in the table above.

Il-18s for London?

ILYUSHIN Il-18 turboprop transports may be seen regularly in London later this year. The Czech airline, C.S.A., which has ordered Il-18s to replace its piston-engined Il-14s, anticipates being able to put the new Russian aircraft on its Prague-London service by the late summer. There is no intention at present of using Tu-104As into London. C.S.A. has three of these aircraft and uses them primarily on the Prague-Moscow service.


COMPARATIVE TAKE-OFF AND CLIMB FLIGHT PATHS
ACCELERATION TO FLAPS-UP SAFETY SPEED
FLAPS-UP
WATER INJECTION CEASES
ACCELERATION TO FLAPS-UP SAFETY SPEED
FLAPS-UP WATER INJECTION CEASES
ACCELERATION TO FLAPS-UP CLIMBING SPEED
COMET 4 — 4 ENGINES
COMET 4 — ONE ENGINE OUT
BASED ON MAKERS FIGURES
HEIGHT — FEET
DISTANCE FROM START OF TAKE-OFF — MILES

FLIGHT-PATH COMPARISON.—This diagram, prepared by de Havilland Aircraft, emphasizes the engine-out climb flight-path advantages enjoyed by a very amply powered turbojet transport such as the Comet 4. The Comet can reach 1,500 ft. and accelerate to flaps-up safety speed on three engines within the five-minute limit for the use of take-off thrust, while the turbojet with a higher power-loading must accelerate early to flaps-up speed so as to have the thrust advantage of water injection and then accelerate again to best climb speed before gaining further altitude.

Air Transport . . . .

To Moscow and Back by B.E.A.

IT must be difficult for anyone to go to Russia with an open mind. There is some peculiarity in human make-up so that one tends on a visit to find what one expects to find and there was plenty of evidence of this on the recent inaugural flights of the new B.E.A. service to Moscow.

The second of the inaugural parties left London Airport a week last Sunday. There was sunshine for the 10 o'clock start, sunshine in Copenhagen and sunshine for the flight over the forests of Sweden and across the islands of Oland and Gotland, but this was beginning to weaken by the time the Russian coast was reached at Ventspils and got no better as the Viscount droned on across the dark forest lands of Latvia and Northern Russia.

On this stage of the flight the closely cultivated lands of Northern Germany and Denmark were replaced by the darker northern forests of Sweden and in the Baltic, as the Latvian coast was approached, floating ice could be discerned. There were no aircraft to be seen as the Viscount hummed along at 23,000 ft. As it crossed the bay of Riga and over the city itself three aerodromes could be discerned. One of them forms one of the alternates for Moscow. It was difficult to realize how entirely cut-off from the Western world the country beneath the Viscount's wings had become.

Forward in the cockpit the crew were hard at their job. On this service two captains are carried in the cockpit and one in the cabin, who takes his turn for training. The radio officer is on constant watch. Always available beside him is the Russian-speaking English-born interpreter.

There are three control areas on the Russian sector of the route; controllers at Riga and Moscow itself speak English but up to the time of the trip there had been no English from the controller at Velike Luki. Other controls are at the alternates at Minsk and at Rjasan to the south-west of Moscow. When a B.E.A. Viscount arrived at Minsk on April 22 to prove the aerodrome it was a tremendous occasion. The whole town turned out and the celebratory banquet was such a success that the Viscount returned to Moscow well behind schedule.

The Watchful Radar

The Russians are extremely strict about traffic keeping to the approved airways. Beacons are placed along them but in addition it seems clear that aircraft using them are under some form of surveillance, presumably from military radar centres. On occasion pilots are given bearings and distances without having requested such information; moreover this has been done when the aircraft has not been transmitting. It seems that also on one occasion, without asking for it, a machine was talked down into Moscow on some form of GCA. At the moment holding patterns are of the simplest, being over one of the beacons, but clearly this is going to change as traffic intensifies.

In spite of the large crew, for besides the flight-deck staff there are three cabin crew, the Viscount even at 100% load factor will be half empty, for the number of passengers has to be kept down to 27 in view of the large amount of fuel uplifted for the Copenhagen-Moscow sector of the flight. This picture cannot be expected to change much until the Comet 4Bs come into service.

On the inaugural trip being described the weather worsened and when, during the let-down, the Viscount slipped through the cloud and over the forest-covered ground the view was limited by rain. Later it appeared that there had been a number of severe storms in Moscow that afternoon, and one eye-witness went so far as to say it had been raining tennis balls instead of hailstones! Anyway, the precipitation was sufficiently severe to smash street lamps.

Immediately the Viscount touched down on the single long lighted runway at Vnukovo, which is just a bit longer than those at London Airport, the high-swept tails of fleets of Tu-104s could be seen like the sails of some fishing fleet; they were interspersed with the less steeply swept tails of the Il-18, similar in general configuration to our Vanguard. There seems to have been a tendency for first visitors to assume, perhaps not unnaturally, that this vast fleet had been assembled especially to impress or to do honour. But as it was present in ever-changing units during the week's stay, and as earlier pictures of Moscow airport have shown similar gatherings, it seems reasonable to assume that the spartan routines of Aeroflot's servicing arrangements have much to do with the placing of so many aircraft out in the open.

Moreover, it has to be remembered that transport operations in Russia are performed along military lines. And no doubt the tradition has persisted in getting Aeroflot under way. It is this background of expendability of equipment that explains, many people consider, the low overhaul lives of Russian turbine engines, at present 400 to 500 hours.

Not only are the control tower and passenger accommodation at Moscow at a minimum, but the maintenance hangars are small by today's standards, few in number and widely separated. The equipment in them may be simple, but, as inspection showed, they are capable of turning out high-grade machined parts.

Maintenance in the Open

When the British Viscount rolled along the wet runway all this was hard to realize. The rain had turned the grass and earth standings on which aeroplanes seemed to be parked into close semblances of farmyards, and the sight of girl mechanics stolidly carrying out maintenance routines completed the rustic illusion. A man could be seen clambering on to the swept tip of a Tu-104 wing and then walking along until he got to the engine installation on which he was working. We later learnt that even in winter aircraft are serviced in the open with boards above the wings to keep the snow off.

Attempts were made in later conversations to obtain serviceability figures, but owing to interpretation difficulties it is unlikely that the figures eventually forthcoming actually related to what was required.

Moscow aerodrome has been photographed many times and though the façade and marble entrance hall are impressive, in scale the buildings are small and of the same order as the old buildings at Croydon. However, as has been said this is something which Russian endeavour will alter as soon as the decision is taken to do so. Meantime the stores for B.E.A. have been speedily fashioned out of a section of an old freight-handling shed. Here again friendliness and a tremendous will to please resulted in the impossible being done in rather less than scheduled time.

The Viscount carrying the inaugural party taxied into place. Later it was found that the Tu-104s used for the bulk of the services in and out of Moscow do likewise but only on special occasion are their engines started on the apron in front of the building. Normally they are towed off the apron to the start of the runway behind one of the lorries which are used for every conceivable purpose. It does not seem to be worth while developing a special tractor for the purpose as has been done in this country. In consequence of these arrangements the noise in the aerodrome building is not excessive.

Walking down the steps into the building one has one's first impact with the bewildering lettering of the Russian language. This, for instance, makes the word for a restaurant appear to an English-speaking person as РЕСТОРАН though in fact it is "restoran," consequently it sounds almost the same as the English word. Incidentally, the Russian word for "station" is Vauxhall and is derived from the famous London junction of the same name.

Incidentally, the aircraft steps, hydraulically adjustable for inclination, are motorized for transition from one aircraft to another. It was also interesting to see an air conditioning plant of a familiar layout whining away alongside aircraft. We were told, but were unable to confirm by inspection, that this plant was made in England.

For Customs clearance one fills in forms, declaring among other things that one is not importing arms or explosives, opium or hashish. When this form has been franked it is returned for clearance on one's way out. There is no difficulty about turning one's traveller's cheques into roubles at 28 to the pound though it is a trifle disconcerting to find that the charming girl who gives one the money uses, with great dexterity, an abacus to work out the necessary calculations. Passport examination is carried out with celerity and then one is off.

Next week the story of what was seen and done will be continued.—T.J.

Air Transport . . . .

Aeroflot on Show

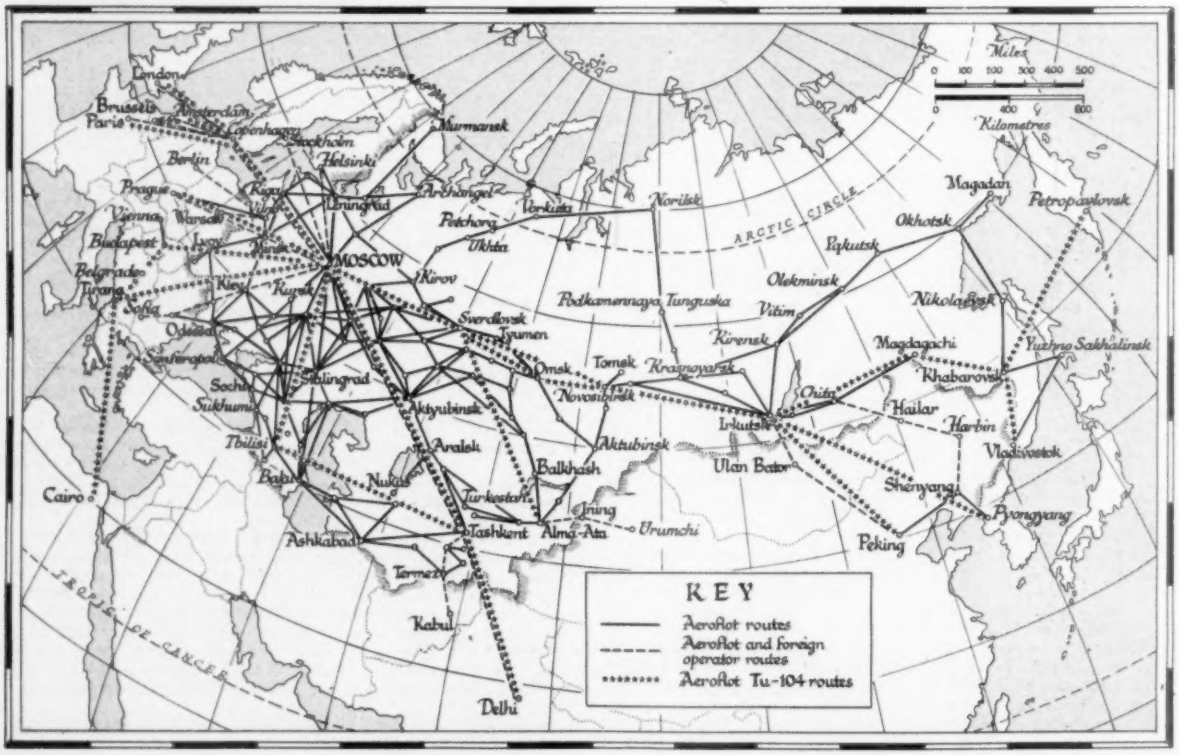
INAUGURATION of the London-Moscow and Moscow-London services by B.E.A. and Aeroflot earlier this month provided an opportunity for a new assessment to be made of Russian air transport progress. Ever since the Tu-104 made its dramatic first appearance at London Airport in March, 1956, it has been evident that civil aviation figures prominently in current Soviet development plans. For many years previously the attention of the aircraft industry was devoted almost exclusively to Soviet defence needs, but a strong domestic and international air transport system has become increasingly important for Russia, not only for its intrinsic value but also for prestige reasons. Hence the rapid development of new aeroplanes and the eagerness to open up international services.

British observers who arrived at Moscow's Vnukovo airport on the first B.E.A. Viscount were impressed by the numbers of Aeroflot aircraft to be seen. They included 20 or so Tu-104s and about 15 of the new Il-18 turboprops, which have recently gone into service on routes from Moscow to Black Sea holiday resorts—and are built at Vnukovo. One example of the other new turboprop, the An-10, was also present for inspection, but this type is reportedly in service in the Ukraine and is not normally seen around Moscow.

Examination of these two new types was permitted, and the details quoted by Russian guides on this occasion agreed closely with those published in our Commercial Aircraft Number on July 4, 1958. The introduction of these aeroplanes into service has not been without attendant difficulties and there are reports (which Aeroflot declined to verify) that the powerplants have been giving trouble. The Il-18 originally had Kuznetsov NK-4

(*Continued on page* 619)

Two of Aeroflot's new turboprops—the Il-18 and the An-10—are seen at Vnukovo Airport in the heading picture. Below is a map of the Aeroflot network, as recently published in a Russian civil aviation monthly.



Only the VANGUARD

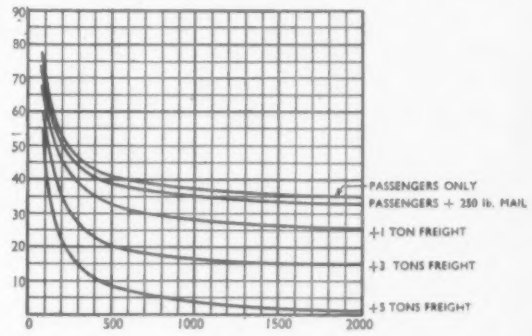
has this low-cost story

THE CONCLUSIONS to be drawn from this simple graph are among the most significant ever put to airline operators. It shows at a glance that the Vickers Vanguard will break even on total costs (indirect costs are taken as 100 per cent of direct) with passenger loads no higher than those actually carried by Viscounts today.

With three tons of freight the passenger break even requirement can be as low as 21 people falling to only 8 passengers when five tons of freight is carried for 500 miles. The Vanguard is a profitable aircraft on today's payloads yet it has room for the inevitable expansion of traffic which, even at a modest progress, makes the Vanguard the biggest potential money earner ever built.

In addition to its outstanding economy, the Vanguard is fully competitive in speed (425 m.p.h. cruise), and its turbo-prop flexibility will enable it to maintain schedules as good as any, while allowing for realistic traffic conditions.

BREAK EVEN NEED–CURRENT TOURIST RATE



BREAK EVEN NEED — PASSENGERS ONLY

500 MILE SECTOR

1 CLASS	31 PASSENGERS
TOURIST CLASS	39 PASSENGERS
*ECONOMY CLASS	49 PASSENGERS

*(20% Reduction of tourist)

Based on current European costs and revenues.

Of all the airliners only the Vanguard has all these features

425 m.p.h. cruising • Freight capacity 10 tons at normal densities • Full routeing and A.T.C. flexibility • Can use normal existing airfields • Quick turn-round • No airfield noise problems • Ten years' unique Vickers/Rolls-Royce turbo-prop experience . . . ***And it is 'Viscount' quiet.***

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FOUR ROLLS-ROYCE TYNE TURBO-PROP ENGINES

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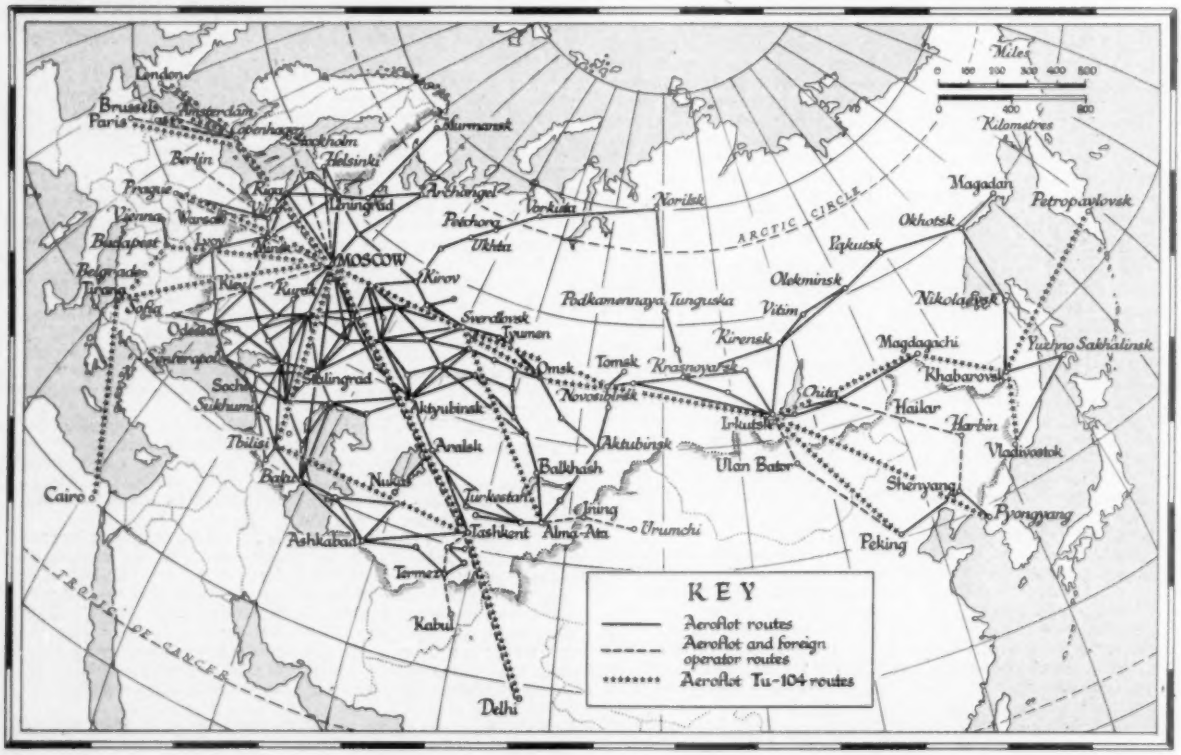

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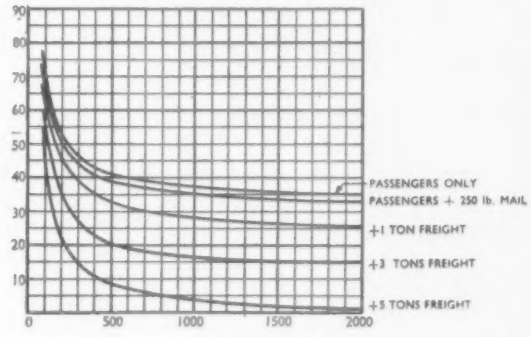

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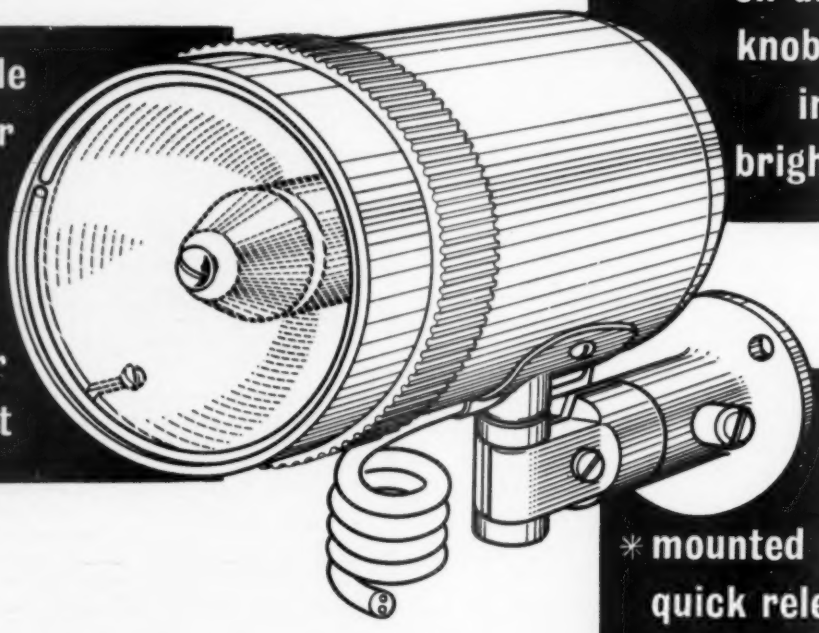
a new, fully adjustable, supplementary lighting unit

The Thorn Cockpit Utility Light can be manually adjusted to spotlight or floodlight any selected area in the cockpit. A quick release mounting is employed which in combination with the extendable cable permits the unit to be used as a hand torch.

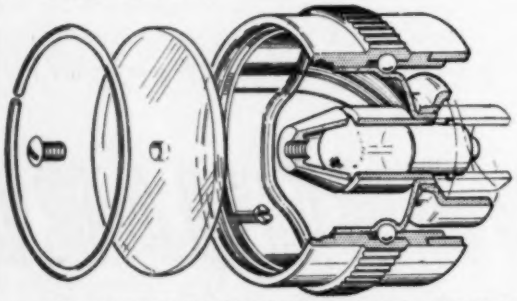
* full dimming facilities.. pressure on dimmer knob gives instant brightness

* Rotatable Bezel for White or Red flood... White or Red spot



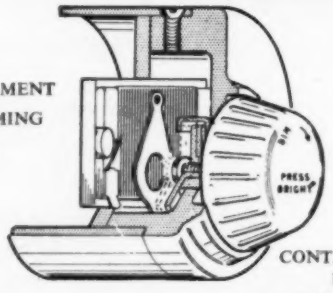
* mounted on quick release universal joint

3·5w 28 VOLT LAMP



BEZEL ARRANGEMENT PROVIDING RED & WHITE SPOT & FLOOD

ARRANGEMENT FOR DIMMING CONTROL



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Air Transport . . . .

(*Continued from page 618*)

and the An-10 has Ivchenko AI-20 turboprops, both of about 4,000 h.p. and both developed originally by German engineers.

Before a new aeroplane goes into service with Aeroflot, it is subjected to extensive service development trials, mostly in the eastern part of the U.S.S.R., and usually carrying freight. It may be that the An-10 is still engaged in such trials. There is evidence that directional stability problems have been encountered on the An-10, which has sprouted end-plate fins on the tailplane since it first flew, and now appears to have anhedral on the outer wing panels. The shape of the engine nacelles has also been modified in detail.

Inside, both the Il-18 and An-10 show signs of Western influence, with greatly improved *décor* compared with the Tu-104As on the service to London. The Il-18 examined in Moscow, for instance, had jade seats with white head-cloths, and pale mauve and grey fabric curtains.

A feature in the An-10 was the provision of individual loudspeakers in each seat headrest; individual reading-lamps were mounted on the seats to shine over the passengers' right shoulders. The Il-18 had 95 seats and the An-10 had 100. The latter type clearly has great potential as a military (and civil) freighter, with its fuselage cross section of 13½ ft. Whereas the Il-18 and Tu-104 have seat-rails, the seats in the An-10 are bolted to pick-ups which appear to serve also as lashing points for freight.

Some detail fittings are standardized in the Il-18, An-10 and Tu-104, including, for instance, ceiling lights and cabin racks. The flight-deck layouts are similar, with a flight engineer between the two pilots and radio engineer behind. In the An-10 the navigator occupies a station in the nose, as on the Tu-104 (see our issue for May 15); in the Il-18, the navigator is behind the captain. In accessories generally, and radio equipment especially, Russia still lags. There was no evidence of miniaturization in the electronic equipment, and integrated flight systems have not been developed. Some form of ground-mapping radar appears to be carried on all the new transports.

The Tu-104B, now coming into service on the much-used Moscow-Leningrad route, also has the restyled interior of the turboprop types. The "B" has 100 seats in a high-density layout, compared with 70 in the Tu-104A, but Aeroflot officials denied that the fuselage was longer, as previously reported. All the new Aeroflot types carry cabin signs in Russian and in English, now regarded as the first foreign language in Russia. Both languages are also used on the flight information bulletins circulated among passengers, even on domestic flights. These bulletins give the names of the captain and cabin attendant, aircraft type and registration, altitude, speed and outside temperature, and details of the flight plan.

In the Vnukovo terminal building, Russian currency is obtained at the cash desk. The abacus is still widely used by Russian cashiers.

Vnukovo's terminal building is about half the size of that at Croydon. Passenger handling is at its simplest; on domestic services, for instance, passengers transfer straight from aircraft to coach, and move off to the town terminal as soon as baggage has been unloaded. Even international passengers can get through Customs and Immigration and on the coach in 20 minutes or so—in favourable circumstances. As traffic builds up the story may be different.

Just how much traffic Aeroflot carries is difficult to discover. A figure of 15 million passengers a year, given by one Aeroflot official, does not seem compatible with the number of services which Aeroflot is known to operate.

A time-table for April, 1959, for instance, shows a total of 2,585 services a week, terminal to terminal, serving 102 Russian cities. Of these services 266 are indicated as mail flights, and some of the remainder are given as mail and passenger or freight and passenger services. Excluding the mail flights, the services break down as follows: Tu-104A (70 seats), 62 international, 102 domestic; Tu-104 (50 seats), 26 domestic; Il-14M (24 seats), 86 international, 1,172 domestic; Il-14 (18 seats), 86; Il-12 (21 seats), 372; Li-2 (15 seats), 410.

Many of these are multi-sector services, but even assuming 100% load factors (which may be arranged) and a complete change of passengers twice on every service (which is improbable), less than ten million passengers a year would be carried.

Also in service in Aeroflot colours, but mostly for agricultural, ambulance and other special duties, are the An-2 and Po-2 biplanes, the twin-engined Yak-12 and the Mi-1, Mi-4 and Ka-15 helicopters.

The Aeroflot time-table shows that a triple fare structure has been adopted, with different rates for the Li-2, Il-12/Il-14, and Tu-104. The rates applied to the Il-18 and An-10 are not known. A list is also provided of the charges for chartering aircraft from Aeroflot, ranging from 14,000 roubles a day, or 19 roubles per route-km., for a Tu-104 to 200 roubles a day for a Po-2 and 1,900 roubles a day for the Mi-4 helicopter.

Civil operations in Russia rely heavily on a series of beacons; there is no evidence of a VOR-type aid in general use. There is a Russian ILS at Vnukovo, where a Pye ILS equipment is also being installed, and GCA is also available—in English as well as Russian. Against this background of few aids and a rapidly growing business, especially from Moscow to the West, Aeroflot's interest in Decca is not difficult to understand.—F.G.S.

Above, Marshal Zhigarev, chief of Aeroflot, bids farewell to Lord and Lady Douglas before the British party's departure for London. Right, the B.E.A. Viscount is towed onto the apron, past a C.S.A. Tu-104A. The pictures were taken by Geoffrey Keating.

The Fighting Services

How the R.A.F. Association Helps

TO-MORROW morning, May 30, H.R.H. Prince Bernhard of The Netherlands will officially open the Royal Air Forces Association's "Air Week" at Brighton, where a full eight-day programme of events has been organized by the Association in collaboration with the R.A.F. and Brighton Corporation.

In addition to the numerous displays, concerts and other events taking place during the week, the Association is holding its annual conference for delegates and visitors from its branches during the last week-end. At this, the policy of the R.A.F.A. is formulated and all aspects of its work are discussed under the chairmanship of the president of the Association.

With a present membership of approximately 100,000, the R.A.F.A. is the largest association of serving and ex-Service personnel in the country. It has nearly 800 branches throughout the World and it is the only organization officially recognized by the Air Council to maintain contact between serving and ex-Service personnel and to safeguard the interests of R.A.F. personnel on their return to civilian life.

It originated in 1931 as the Comrades of the R.A.F. Association. Ten years later it merged with the old Comrades Association of the W.R.A.F., which had been formed in 1919. In 1943 its title was changed to the R.A.F. Association, which was granted a Royal Charter of Incorporation by H.M. The Queen on December 4, 1952. The president of the Association is Marshal of the R.A.F. The Lord Tedder, and former presidents include H.R.H. The Duke of Edinburgh and Marshal of the R.A.F. The Viscount Trenchard.

Membership is open to any one who has served not less than three months in the R.F.C., R.N.A.S., R.A.F., W.R.A.F., their Auxiliaries or Reserves, the R.A.F. Nursing Service or a Dominion or Colonial Air Force. Many branches of the Association now have their own clubs, and Association members travelling at home or overseas are assured of a warm welcome by fellow members wherever there is a R.A.F.A. branch.

The R.A.F.A. deals with the pensions, legal, employment, sickness and other general-welfare problems of all men and women in the Royal Air Forces, and their dependants, whether or not they are members of the Association. It maintains a convalescent home at St. Anne's-on-Sea, Lancashire, for ex-R.A.F. and W.R.A.F. personnel and their dependants. Serving personnel and their dependants are also eligible for admission.

A good guide to the present-day work of the Association can be obtained from its activities during 1958. In that year its overall membership strength was maintained and four Areas increased their numbers. In addition, five new branches were formed. Its financial results for the year, although less encouraging than in 1957, are also regarded as satisfactory, bearing in mind the greatly increased momentum given to the Association's work. With one exception all the Areas balanced their accounts and made it possible for the R.A.F.A. as a whole to pay its way on administration.

The work of the Association overseas, which is an important part of the organization, continues to expand with the formation of two new branches in Australia—at Adelaide and Broken Hill—and the reopening of the Grahamstown and Queenstown branches. The branch in Adelaide is the second to be formed in Australia and, like the Sydney branch, is making good progress. Inquiries are proceeding with the object of forming branches in Melbourne, Perth, Addis Ababa and Sharjah.

A substantial increase in the overall membership of the overseas branches has taken place during the past 18 months, mainly because of the achievements of the Christmas Island branch.

Photograph copyright "The Aeroplane and Astronautics"

The Association's national headquarters at Portland Place, London.

This branch, since its formation in December, 1957, has recruited more than 900 members, all of whom are serving personnel. During this period it has also made the largest single donation from any branch at home or overseas with a sum of £200 to the convalescent home at St. Anne's-on-Sea. The success of the Christmas Island branch is a good example of what can be done on R.A.F. stations in recruiting Service personnel provided that there is good organization and leadership.

To further the interests of the Association and to recruit new members from among the Service personnel with 2nd T.A.F. in Germany, unit liaison officers have been appointed. Now that the position of the Command has become stabilized the R.A.F.A. is hoping that it will be possible to form branches on selected R.A.F. stations.

At Brighton next week the Association is planning its most ambitious projects to date. In addition to the air display at Shoreham Airport on May 30, the "Air Week" programme includes daily air/sea rescue demonstrations by helicopters of the R.A.F. Thorney Island detachment of No. 22 Squadron in conjunction with No. 1107 Marine Craft Unit launches from Newhaven; displays by R.A.F. police dogs; and performances by the Central Band of the R.A.F. and the Royal Netherlands Air Force band.

The Shoreham air display, organized by the South-Eastern Area of the R.A.F.A., will include aircraft from the R.A.F., the Fleet Air Arm, the U.S.A.F. and the R.Neth.A.F. Apart from the R.A.F. participation outlined in our issue for May 22, there will be an Avro 504K and a Gloster Gladiator, a Spitfire piloted by Mr. Jeffrey Quill and a Hurricane flown by Mr. A. W. Bedford. The U.S.A.F. will be represented by a fly-past of F-100 Super Sabres, F-101 Voodoos and a KB-29 Superfortress.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. E. F. Wain, O.B.E., to the department of the Air Member for Personnel.

Flying Training Command: Sqn. Ldr. C. J. Samouelle, D.F.C., to No. 8 F.T.S., Swinderby, as Chief Instructor, with acting rank of Wg. Cdr.

Technical Training Command: Gp. Capt. C. G. Sharp to No. 1 School of Technical Training, Halton, as Senior Administrative Officer.

Maintenance Command: Sqn. Ldr. P. N. Kingwill to Headquarters for work study duties with acting rank of Wg. Cdr.

R.A.F. Germany (2nd T.A.F.): Gp. Capt. R. G. Stone to Headquarters as Command Engineering Officer; Wg. Cdr. D. A. Trotman, A.F.C., to R.A.F. Gutersloh, to command the Flying Wing.

Middle East Air Force: Wg. Cdr. R. C. Haine, D.F.C., to R.A.F. Akrotiri, Cyprus, to command the Administrative Wing.

Other Appointments: Wg. Cdr. E. W. Wright, D.F.C., D.F.M., to SHAPE; Wg. Cdr. R. A. Jell, D.F.C., A.F.C., to Headquarters, British Forces Arabian Peninsula, for organization duties; Sqn. Ldr. O. B. Parker to M.o.S., with acting rank of Wg. Cdr.

REUNION

No. 66 Squadron.—A reunion will be held in London on July 24 to celebrate the 25th anniversary of No. 66 Squadron's operational service. Former air crew members who are interested can obtain further details from the Squadron Adjutant at R.A.F. Acklington, Morpeth, Northumberland.

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It can be shaped to fit any installation, complex shapes presenting no problems, and the units will retain their form during the lifetime of the components to which they are fitted.

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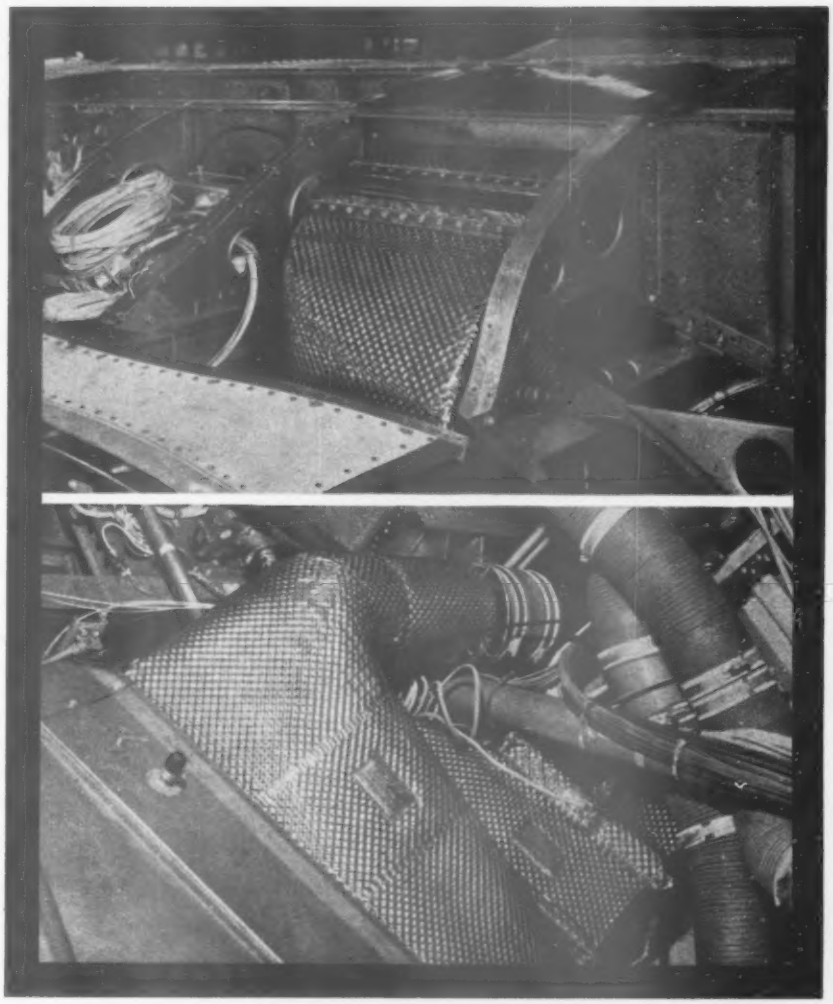

Ducting fitted to the inlet and outlet ports of the heat exchanger on the Handley Page Herald.

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The Westminster is the largest conventional helicopter in the Western world. It has the ability to transport as many as 51 fully equipped troops and to convey mobile field units such as hospitals, food kitchens, living huts, vehicle servicing centres and operations rooms from supply bases to assault areas. It may also be used to recover unserviceable aircraft and ground vehicles and to transport complete missiles from storage units to firing sites. All of these capabilities meet the requirements of modern army, naval and air operations.

The Westminster is powered by two Napier "Eland" gas turbine engines and can operate with full payload on one of them if need be.

The picture above shows a section of an assault floating bridge weighing 6,736 lb. being lifted.

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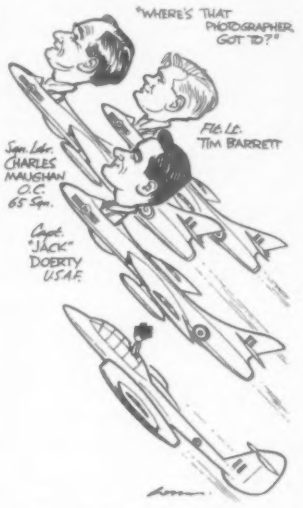
The FIGHTERS of DUXFORD

THE Royal Air Force is studded with great names—men, machines and places. About 10 miles south of Cambridge, on the Newmarket road, there is R.A.F. Duxford, the sole survivor, in Fighter Command, of World War I stations. Here, for more than 40 years, great men and great aeroplanes have served and flown and fought. Like the well-known theatre, it has never closed, but it seems likely that its days, and its nights, may be numbered, at least, as a fighter station; it is 70 miles from the coast, and in these days when seconds are as precious as minutes used to be, that's quite a way.



The history of Duxford dates back to 1918, when the Service under its present title was formed. Many of the buildings, notably some hangars, were built in that year and exist today substantially in their original form. It is a small station, with the buildings so compactly disposed that private cars are not needed — nor indeed, are they allowed—on the flying side of the road.

At the close of the First World War, No. 2 Flying Training School was stationed at Duxford, flying Bristol Fighters, and it remained there until June, 1924, when it moved to Digby. Duxford was transferred to Fighter Command in that year and has been a fighter station ever since. Three Sopwith Snipe squadrons, Nos. 19, 29 and 111, were then based there, flying from a grass airfield about a quarter of the present size. The following year the station was enlarged.

During 1935, the Jubilee Year of King George V and Queen Mary, Their Majesties held a review at Duxford, when a flying display was given by Gloster Gauntlets, the biplane fighters then in service. A large tablet marking the occasion is situated inside the main gates. A Met. Flight, using Gauntlets and Gladiators, did remarkable all-weather flying, earning more than one A.F.C. the hard way.

Photographs copyright "The Aeroplane and Astronautics"

HUNTERS.—Two operational pairs of No. 65 Squadron in maximum climb attitude.

On August 4, 1938, the first Spitfire arrived on the station and Nos. 19 and 66 Squadrons began training on the beautiful and deadly fighter which was to play so important a part in the Battle of Britain two years later. In the first few months of the War, new squadrons, including Nos. 310 and 312 Czech squadrons, were formed at Duxford and the station began its vital rôle as a front-line fighter airfield. Hugo, Tuck, Bader and Beamish were among those who led their squadrons and wings from Duxford.

In 1943 the station was handed over to the U.S. Army Air Force. Previously, in 1941, No. 133 Eagle Squadron, with American pilots, had formed at Duxford. The U.S.A.A.F. promptly closed the public highway running through the station, causing considerable local inconvenience, but, we hope, were assisted thereby in the prosecution of their fighter operations Until the end of the War they flew from a PSP (Perforated Steel Plate) runway which still lies, overgrown, on the south side of the present 6,000-ft. runway, where it provides a useful stand for the mobile runway control van.

The new runway was laid down in 1949 along with the large areas of concrete known as ORPs and ASPs—Operational Readiness Platforms and Aircraft Servicing Platforms—essential to operation of modern aircraft. In 1953, on Coronation Day, the Duxford Wing led the salute to Her Majesty The Queen on her return to Buckingham Palace.

On the list of the station's Commanding Officers there are some evocative names: Wilfred Freeman; W. H. de W. Walder, who, I believe, used to ride from his house to his office on a horse; John Grandy, who was, like Donald Finlay the hurdler, and Alan Deere, a Battle of Britain pilot.

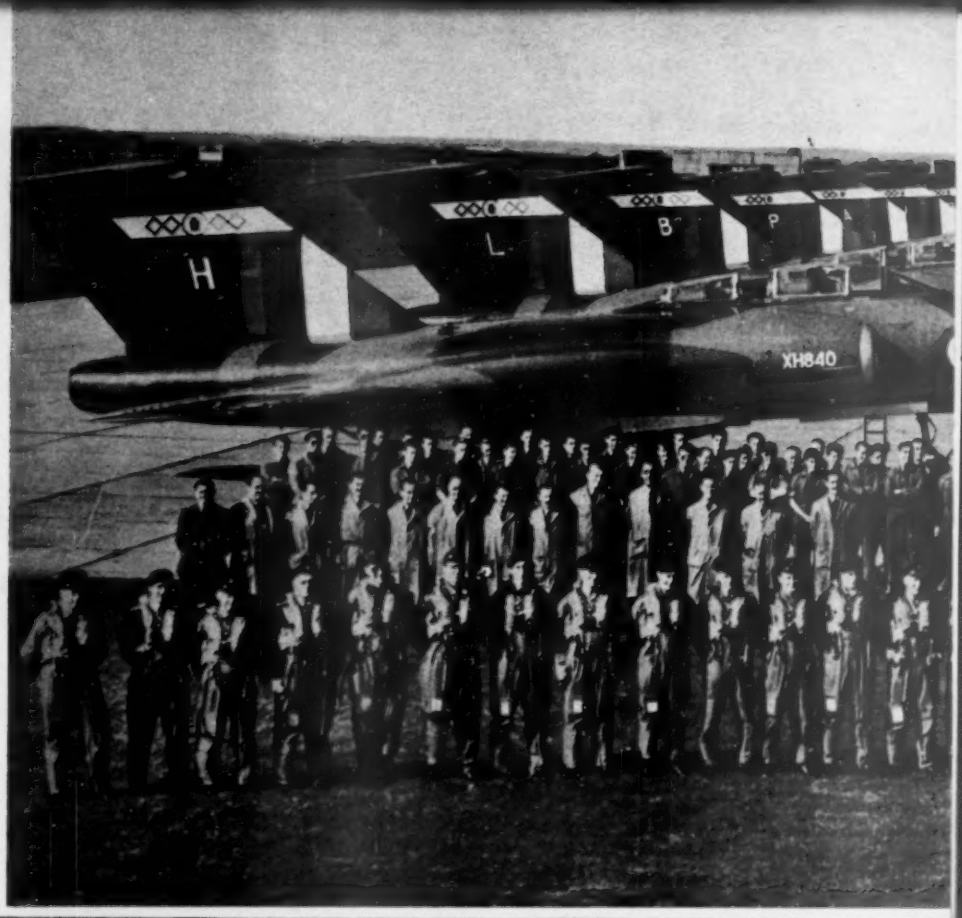
(*Continued on page 624*)

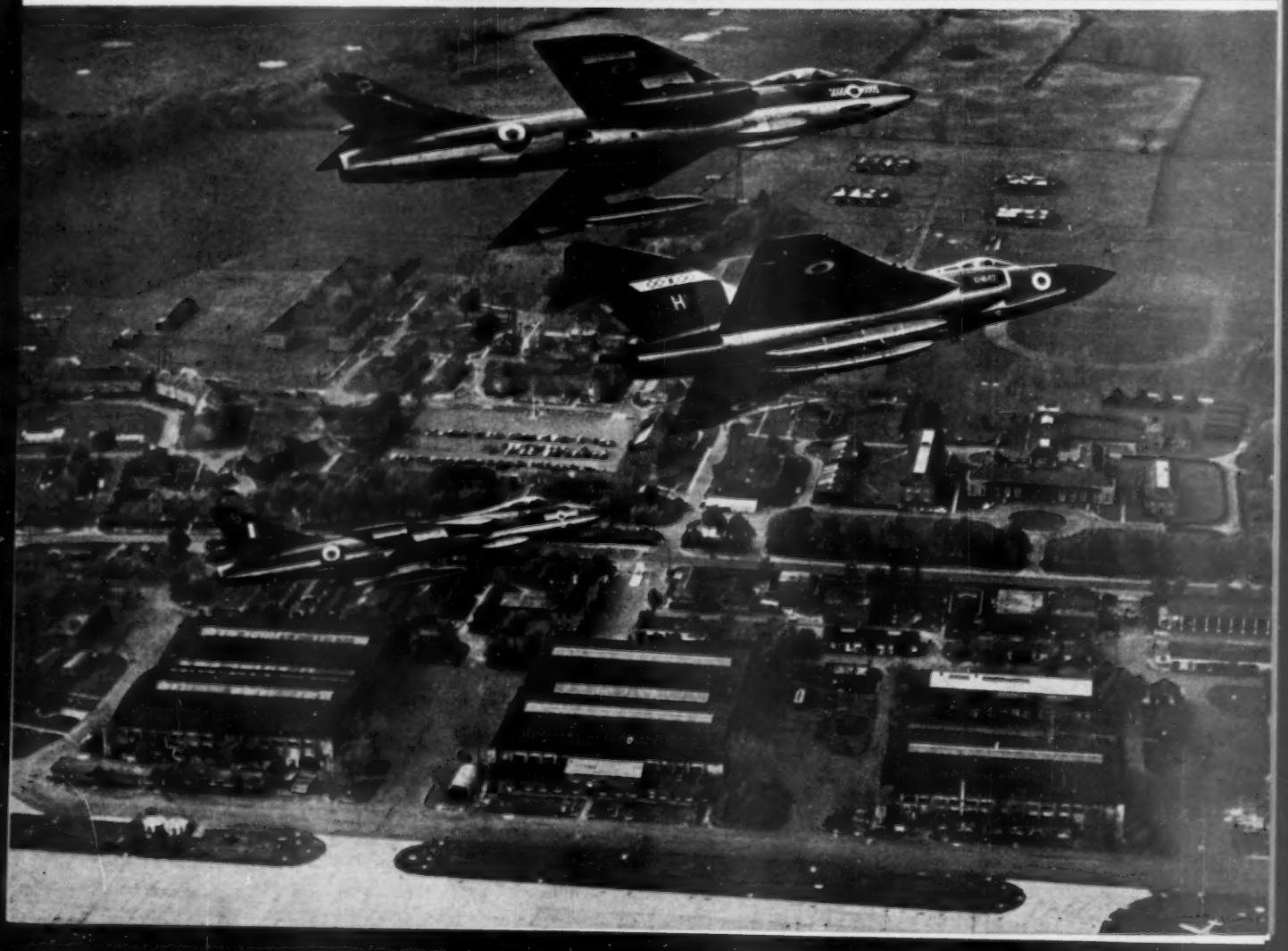
ALL-WEATHER FIGHTER.—A dusk impression of a Javelin 7 of No. 64 Squadron.

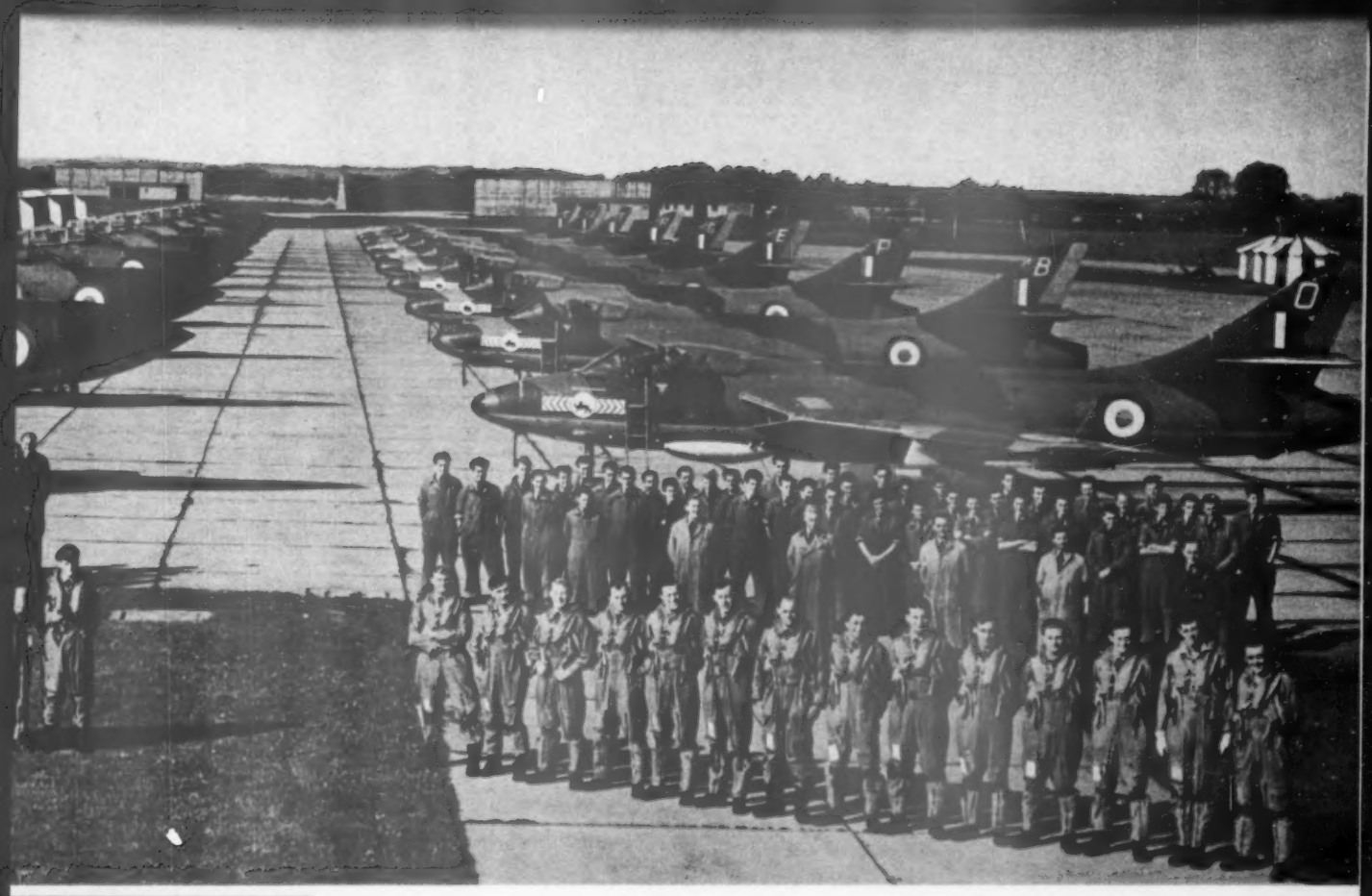
The Fighters of Duxford . . . .

Right, air and ground crews of Nos. 64 and 65 Squadrons on parade with their Javelin 7s and Hunter 6s at Fighter Command's oldest operational station.

Below, a combined squadron flight above the 1918-vintage hangars and the parked Spitfire which reminds visitors that Duxford was the first Spitfire station.







At Fighter Command's Oldest Operational Station

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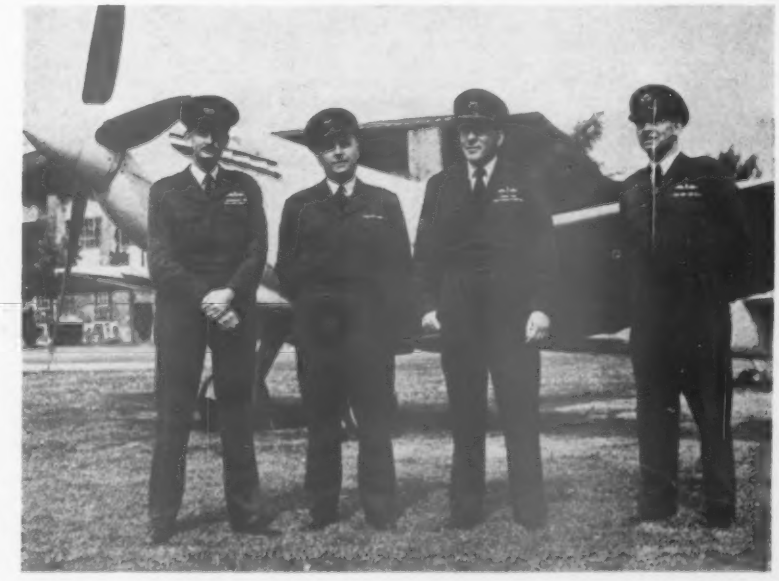

Above, Gp. Capt. E. N. Ryder, D.F.C., the Duxford Station Commander (second from right), and his wing commanders. Left to right, Wg. Cdr. J. H. S. Broughton, D.F.C., A.F.C. (Admin.), Wg. Cdr. W. C. T. Brown (Tech.), Wg. Cdr. R. W. Leggett (Flying).

Photograph copyright "The Aeroplane and Astronautics"

(*Continued from page 621*)

Air Chief Marshal Sir Harry Broadhurst and Air Chief Marshal Sir Claude Pelly were flight commanders with 19 Sqn., which had its permanent home at Duxford. It was the first squadron to get Spitfires. Out of No. 19 there was established No. 29 Squadron, which on its formation in 1923 had only one officer, Jim Cordes, who later became Handley Page's chief test pilot and is now Clerk of GAPAN.

Alongside the control tower there stands a pale-blue Spitfire, SL542, of uncertain Mark, though it is possibly a PR.16 (except that it has cannon projections on each leading edge). No more suitable symbol for Duxford could be imagined unless, say, a representative biplane fighter could be found for the other side of the tower.

The present station C.O., Gp. Capt. E. Norman Ryder, D.F.C., is also in the Duxford tradition. A pre-War Hawker Fury pilot with No. 41 Squadron, he did a short Spitfire conversion course at Duxford with No. 19 and then flew Spitfires in combat until he was shot down in October, 1941. Early in 1940, with No. 41, he earned the doubtful distinction of being the first British pilot to be shot down over U.K. following his shooting down of a Heinkel He 111, when he made the mistake of stopping to see the German crew crawling out. He has commanded Duxford since August of last year and has a great regard for it.

The Duxford Wing (Wg. Cdr. R. W. Leggett) comprises two squadrons—No. 64 Night/All Weather Fighter Squadron and No. 65 Day Fighter Squadron together with a Station Flight of instrument-training Meteors. These moved in after the Station's "face-lift" was completed in August, 1951.

No. 64 Squadron (Wg. Cdr. J. A. Wright, M.B.E., D.F.C.)

Javelin 7s are the equipment of No. 64 Sqn., which was formed at Sedgford in 1916 and then moved to France in 1917 with its D.H.5 low-altitude single-seat fighters. In 1918 they were launched into the thick of the battle with their new S.E.5As and at one period were averaging over 75 hr. flying each day. Three months after the Armistice was signed No. 64 returned to England and were disbanded. In all, it had accounted for 135 enemy aircraft.

The squadron was re-formed in March, 1936, at Heliopolis and equipped with Hawker Demons. In the same year they moved to Martlesham Heath, then to Church Fenton where they were equipped with Blenheim IFs. In 1940 they were at Croydon, converting to Spitfires, with which they moved to Kenley to fight in the Battle of Britain, shooting down 40 enemy

FORTY-TWO YEARS ON.—Officers of No. 65 Squadron R.F.C. in 1917 and their present-day counterparts of the R.A.F. (who had obviously taken a peep at the Squadron album !).

aircraft between July and October. Then they moved to Coltishall and later to Hornchurch, whence they took part in Channel sweeps. The various marks of Spitfires they had operated were replaced in 1944 by the Mustang III, which they kept until the War's end.

No. 64 was the proving squadron for the D.H. Hornet in 1946, moving to Church Fenton in '47 and later to Linton-on-Ouse where it flew in the rôle of long-range low-level intruders. At the beginning of '51 the Intruder Wing was disbanded and the Squadron reverted to the high-level interceptor rôle with Meteor 8s. In August of that year it moved to its permanent peace-time base at Duxford. The rôle of the Squadron changed in September, 1956, to Night and All-Weather operation, with Meteor 12s and 14s, which were later replaced by their present equipment.

No. 64's present C.O., Wg. Cdr. J. A. Wright, is probably the most experienced night-fighter pilot still flying in the Service. A contemporary of John Cunningham, in No. 604 Squadron, he has for some 18 years spent all his squadron time in this rôle.

No. 65 Squadron (Sqn. Ldr. C. G. Maughan)

Like its companion squadron, No. 65 was formed in 1916 but with Sopwith Camels, with which it fought throughout the First World War, mainly in co-operation with the Army. On November 4, 1918, it destroyed 15 enemy aircraft, a feat commemorated in the squadron badge by 15 swords displayed behind a lion, part of the arms of Dunkirk, with which town and district the Squadron was closely associated. More than 20 years later, No. 65's Spitfires provided cover at the Dunkirk Evacuation. After the First World War, in 1919, the Squadron was disbanded.

At Hornchurch, in 1934, No. 65 Squadron was re-formed with Hawker Demons. In '36, they received Gladiators, in '37 Gauntlets. Their Spitfires scored 32½ in the Battle of Britain. From Turnhouse they then made fighter sweeps and escort duties until, in '43, they left the North to do the same work from various bases in Southern England. Later, with Mustang IIIs, they escorted American bombers, and then, operating from Peterhead, protected Coastal Command aircraft on shipping strikes off Norway, and continued various kinds of escort duties until, by the end of the War, No. 65 claimed 119½ enemy aircraft destroyed.

They began their association with No. 64 Squadron at Horsham St. Faith in 1946, with Spitfire 16s. They also went through the Hornet intruder phase which ended in 1950, when the Squadron returned to day-fighter operation with its first jet aircraft, Meteor 4s. These were replaced in '51 by Meteor 8s and in August that year they moved to Duxford. They kept their Meteors for six years, until March, '57, when they started getting their present Hunter 6s.

They have recently returned from a tour in Cyprus and now, with No. 64, look forward to getting their Squadron Standard. Everybody at Duxford hopes that this will be a double presentation, the first of its kind, and a great occasion for this fine old station.—WREN.

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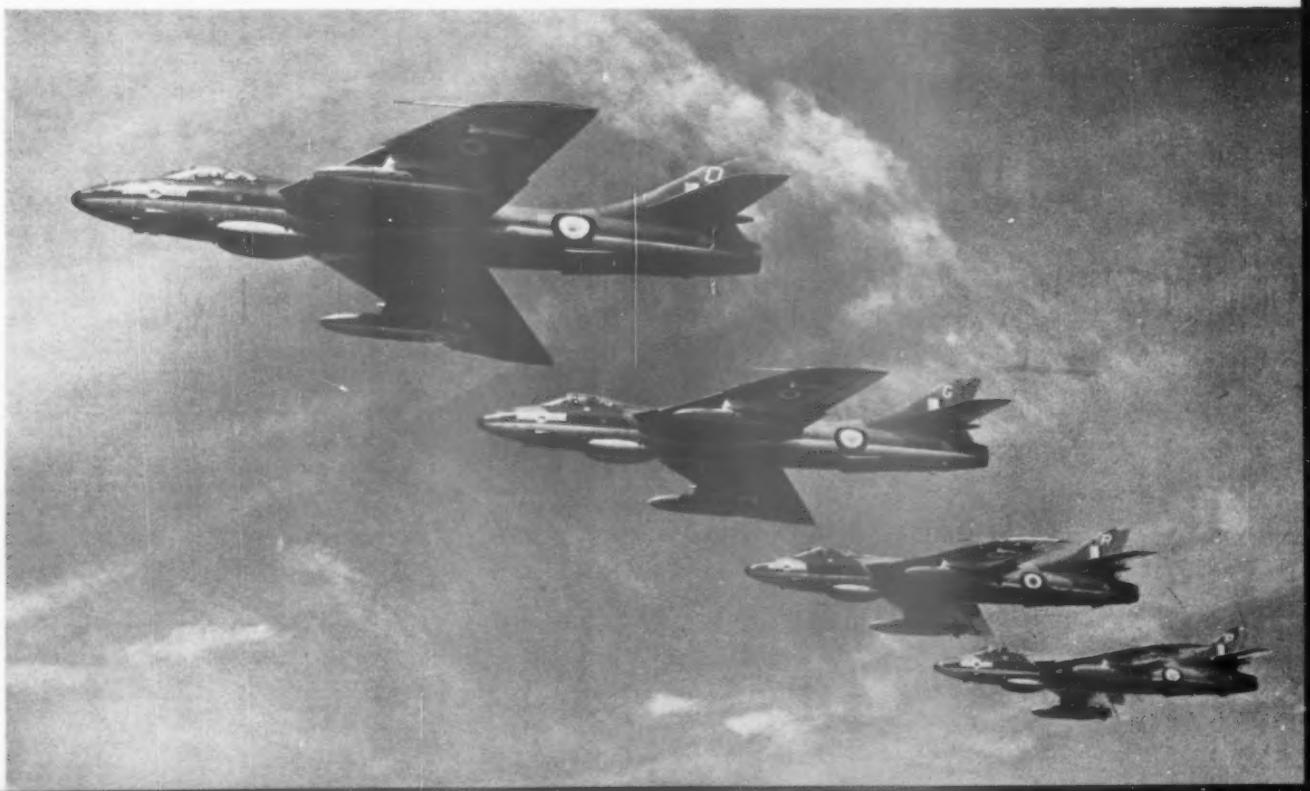


ASTRONAUTICS and MISSILES

The Missile Gap

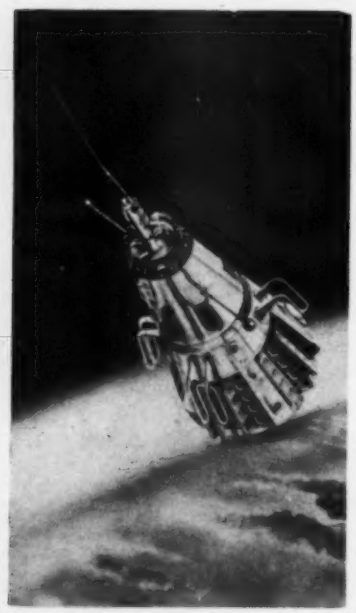
Dr. S. F. Singer* discusses Russia's ballistic potential

BALLISTIC missiles are quite different from guided missiles. Their trajectory from launch to target is fixed by the laws of celestial mechanics and is very closely a portion of an ellipse. A ballistic missile can be launched from land, from the oceans, or even from an aeroplane. These approaches are all being pursued. Some are further advanced than others. We may assume that the Russians are pursuing similar approaches and that they are more advanced in some and probably less advanced in others.

Depending on the desired range, we divide ballistic missiles into two classes: IRBMs and ICBMs. There is no sharp division between them. Except for the fact that the ICBM requires a larger rocket booster, they are basically similar. They are both "told" what their target is before launch. The electronic brain takes note of the instruction and causes the rocket motor and guiding system to be controlled so that at burn-out the missile is on the proper trajectory which will carry it to the target. Since the burning of the rocket lasts only for a few minutes, the missile for most of its flight is not controlled. By the same token, its trajectory cannot be affected by the defender. No jamming is possible.

Counter-measures have to be of a physical nature involving either destruction of the warhead while it is still in flight, or deviation of the trajectory by somehow applying a force to the vehicle. Before we can think about counter-measures we have to be able to detect the launching and find the vehicle while it is in flight. An ICBM moves at nearly satellite velocity (18,000 miles per hour). A typical time from launch to target is of the order of only 30 minutes. The only feature of a ballistic missile which favours the defence is the fact that its trajectory is fixed; it cannot take evasive action. However, the defence can be overwhelmed by decoys which simulate ballistic missiles on the radar screen.

There has been a lot of discussion recently concerning the "missile gap." The question apparently is not only who is ahead, but by how much, by what factor, today, by next month, next year, and so on.



An artist's impression, by J. W. Wood, of Sputnik III—a veritable "space-laboratory" weighing 26 cwt.; this was an indication of the large launching vehicles available to the U.S.S.R.

All we know for sure is that the Russians have a large rocket booster of around 800,000-lb. thrust. They have used it for their Sputniks and for Lunik, their Moon rocket. We know a little about their guidance accuracy. It seems adequate for satellites but, as judged from their Moon rocket, it is not especially high. There are many who are convinced that the Russians really aimed to hit the Moon and that the escape into the solar system is simply a consequence of the fact that they missed their target. We know nothing about their experience with bringing a warhead back safely through the atmosphere, but we should assume that they have solved the problem in an adequate manner, possibly in the same way in which we have solved it.

But all this discussion, particularly discussion of the numbers of rockets, may be academic since they may never be fired for military purposes. This statement presupposes that the Russians would not start an all-out missile war if they know that we can retaliate against their cities. This assumes all sorts of things about the Russian leaders. It assumes that they are logical, rational and to some extent sensitive to the desires of the Soviet citizens, who are reasonably happy or have done quite well under the régime. Those people may not want to lose whatever they have gained by hard work and careful playing of their cards throughout the Stalinist era. This assumes also that there will be no mistakes ranging from errors in judgment or failure of some piece of equipment, to actual deliberate sabotage by a deranged individual or possibly by a third nation.

The key to the whole discussion is, of course, the strategy of attack associated with ICBMs carrying hydrogen bombs. The strategy is that of the surprise blow which knocks out primarily the opponent's retaliatory power and, secondly, his cities and centres of communication, etc. If this first blow does not succeed, and if even a fraction of the retaliatory power is left, then the opponent can concentrate it on the cities of the attacker, which are few in number, heavily populated and harder to defend than underground missile bases.

The key to the attack strategy is a mass attack, using hundreds, or even thousands, of missiles fired almost simultaneously against all the available and potential targets. This strategy may be so basic that, possibly, an attack by a single missile would be chalked off to error. Has it ever been considered what the U.S. response would be if a single ballistic missile with a hydrogen-bomb warhead were to explode in that country? One doubts whether instant massive retaliation would automatically follow on the part of the U.S.

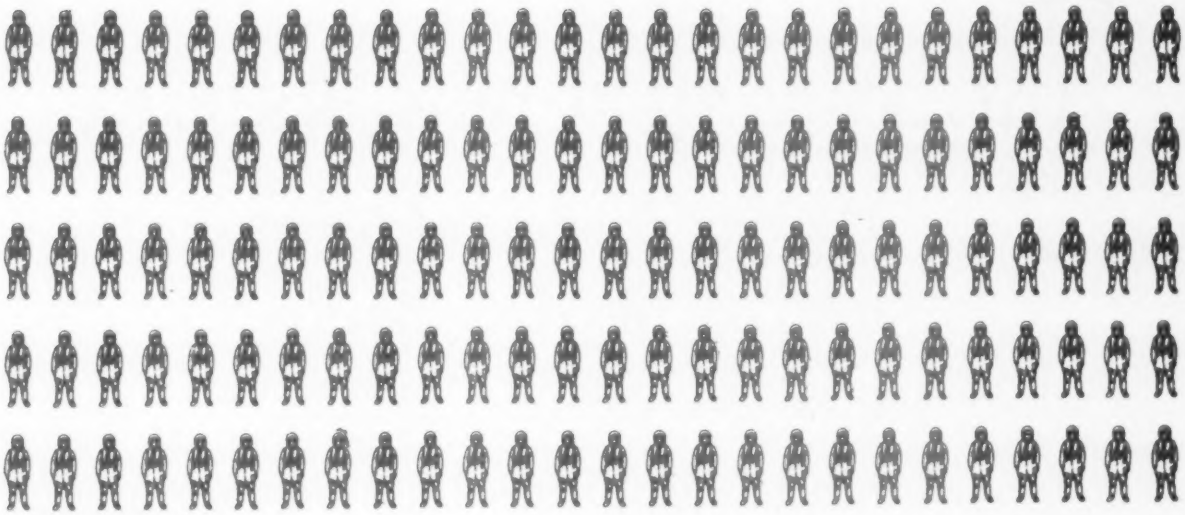
This discussion makes one wonder whether the Russians have not made two very serious, almost fatal, mistakes in planning their ballistic missiles programme. They started their programme according to a plan which was laid down perhaps 12 years ago and which followed very closely the German plan. This programme was an extension of the V.2 strategy: you build a big rocket, the bigger the better, so that it can carry a warhead just as large as possible, preferably 10,000 lb. or more. Then you fire these rockets with their TNT warheads against New York at the rate of one a day, or maybe several a day, and after a few weeks you will have quite a few holes in Manhattan and maybe quite a few in the Atlantic Ocean.

This concept was fine when warheads were filled with TNT, but it no longer works today. It means really that the Russians are saddled with a rocket which is much larger than necessary to deliver the required explosive power—because now the warhead is a hydrogen bomb which may weigh only 1,000 lb. With their present rockets the Russians require about 500,000 lb. of propellents, most of it in the form of liquid oxygen. Even if only 200 missiles were fired, the total amount of propellents reaches the fantastic figure of 100 million lb.

Now imagine the whole complex of operations of preparation, logistics, down to the final fuelling, check-out of electronics and guidance, and launching, all of which must be

(*Continued on page 627*)

* Professor of Physics, University of Maryland (based on a talk given at the Roosevelt Day Dinner, sponsored by Americans for Democratic Action, at Akron, Ohio).



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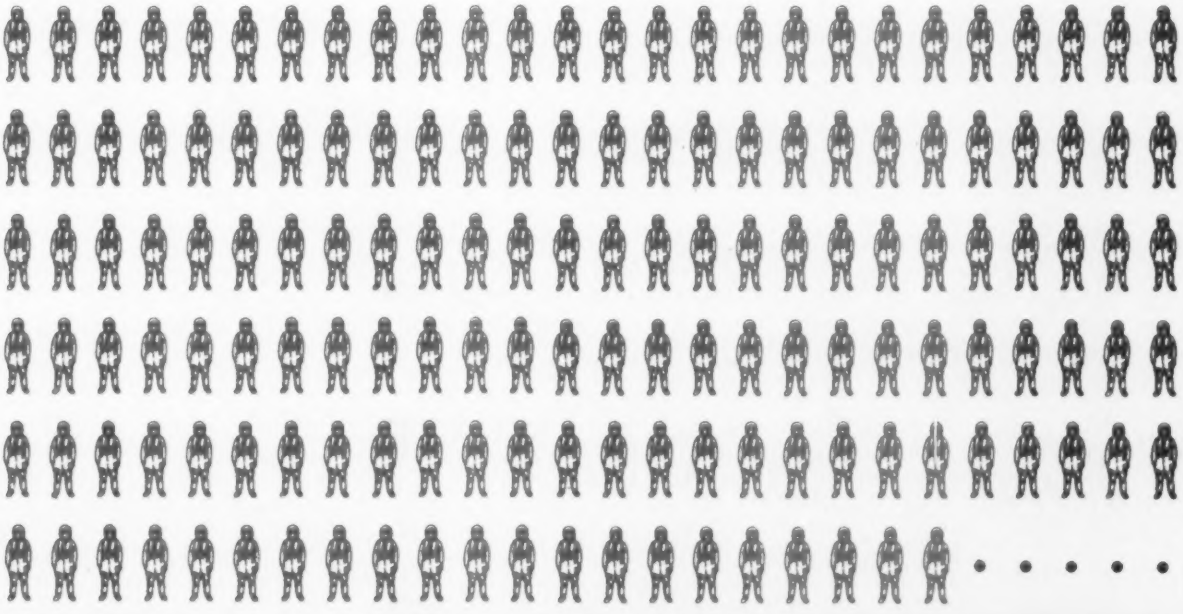

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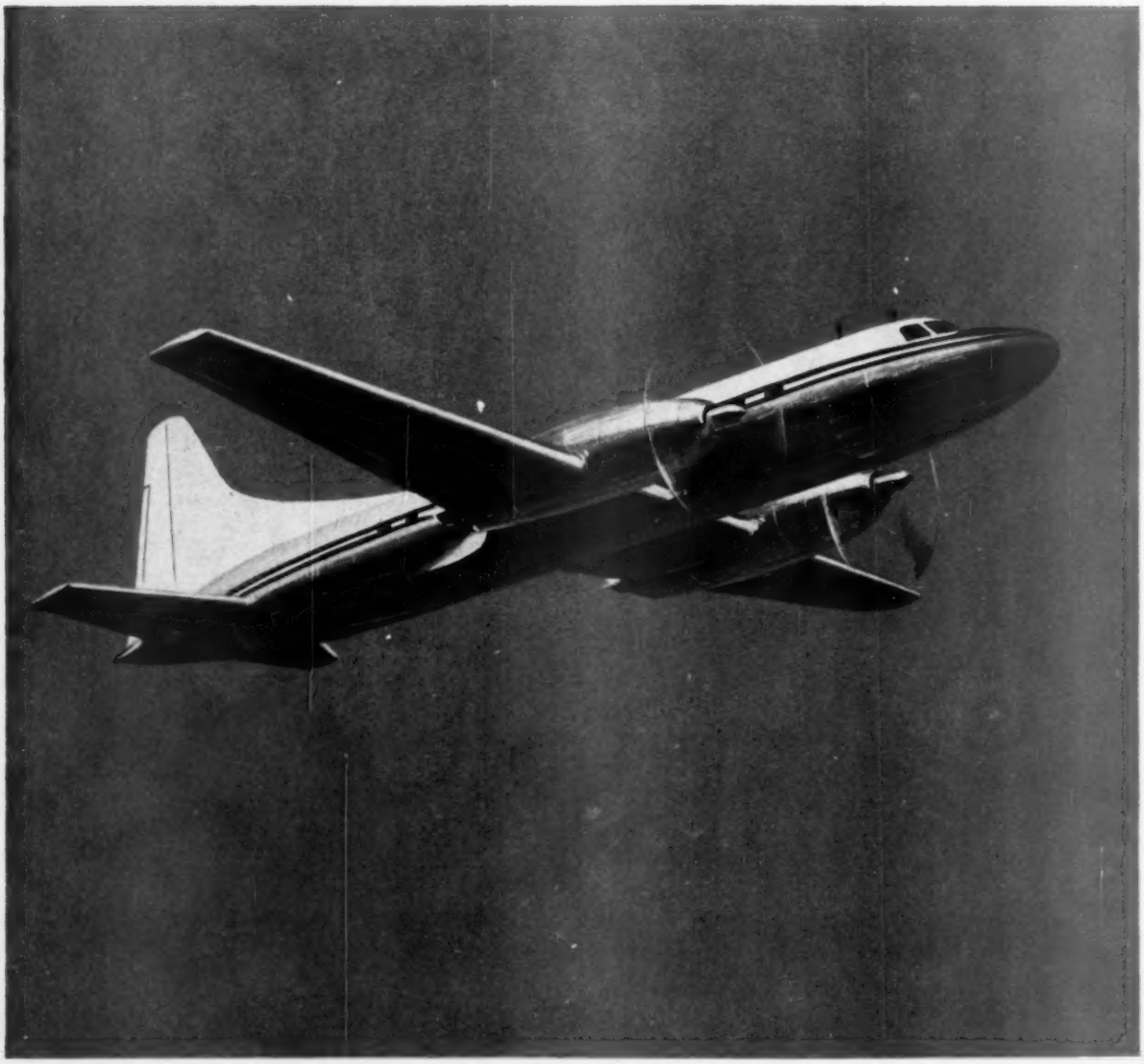

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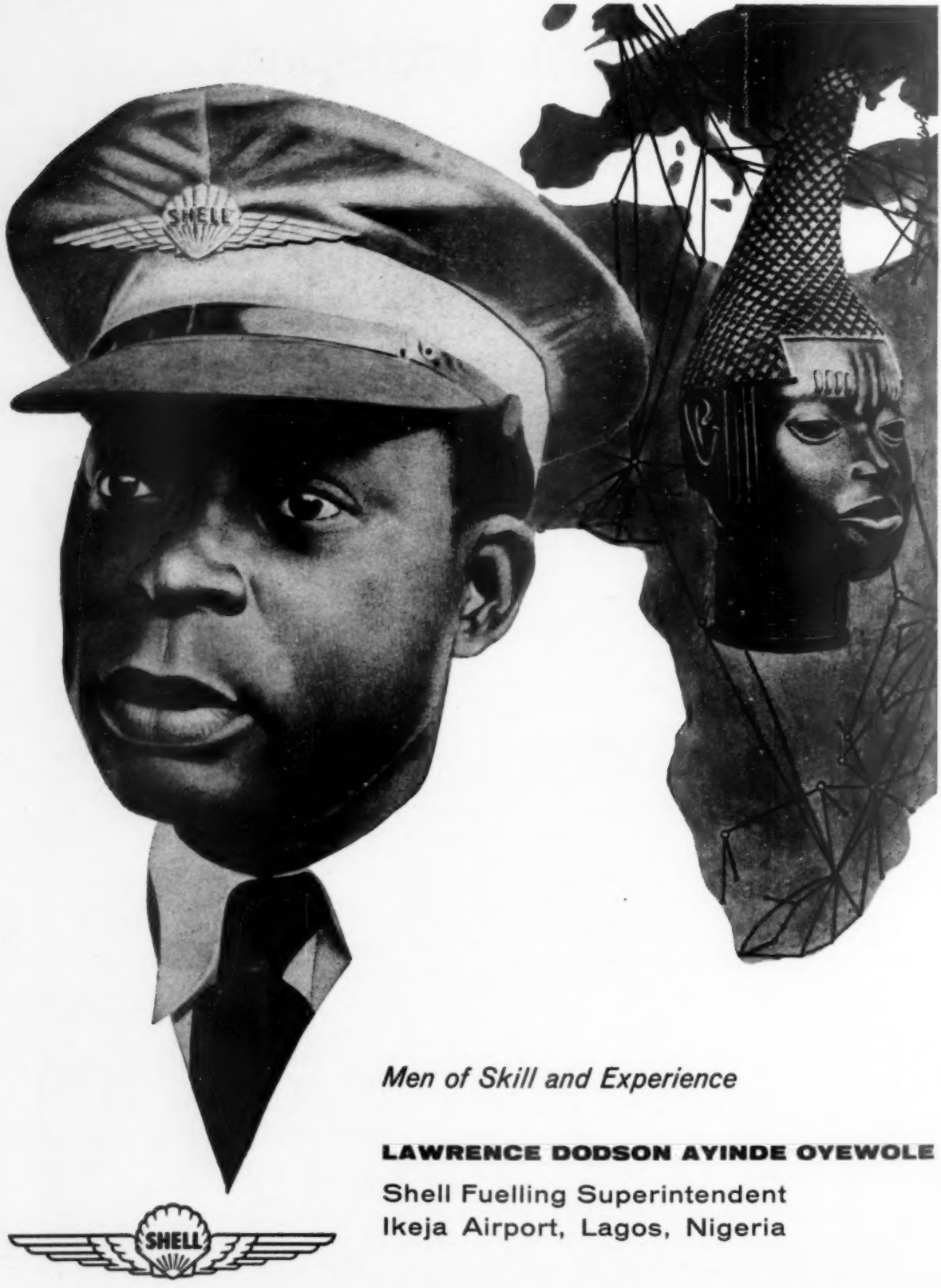


Men of Skill and Experience

LAWRENCE DODSON AYINDE OYEWOLE

Shell Fuelling Superintendent
Ikeja Airport, Lagos, Nigeria

SHELL

ONE OF THE MEN RESPONSIBLE FOR SHELL WORLD-WIDE AVIATION SERVICE

(*Continued from page 626*)

accomplished in a very short time. In order to be really effective all launchings have to take place within a couple of hours. That's a staggering job and is likely to use up a good part of any country's industrial complex.

In America we started our ballistic missile programme much later and have not, as yet, perfected a rocket as large as the Russian one. But we have built rockets, and are now testing them, which are adequate to carry a hydrogen-bomb warhead over the required distance. Our rockets are much smaller and require less propellent.

The Russians have announced that their ICBMs are now in serial production. One would assume that this refers to the liquid-fuelled type which was used as the Sputnik launcher. Here, again, the Russians may have made a serious miscalculation. Some time ago apparently they decided that solid rockets could not perform the job. To their credit, we must admit that we came to a similar decision, but our decision has been reviewed considering the fact that solid-rocket technology has advanced, and in view of the fact that our rocket size requirement is much smaller.

The Navy's Polaris rocket, the Army's Pershing, and the Air Force Minuteman rocket are all solid-fuelled ballistic missiles and they have all the advantages of a solid-fuelled rocket. They can be stored in readiness and fired with only a few seconds' notice. They can be transported easily. A Polaris can be fired not only from a submarine, but also from a surface vessel which could be constantly on the move. The Pershing could be fired from a railway flatcar, which can be moved about. And, in addition, the Air Force is perfecting an air-launched version of a ballistic missile.

This great variety of mobile, although short-range, rockets gives us a practically indestructible potential to retaliate and, hopefully, to deter. We may find it possible to cut down on more conventional weapons. We may find it profitable to give up fixed air bases and missile bases in Europe, a fact which may help us politically as well as economically.

Now we should note that our missiles cannot prevent an attack upon us. We will simply have to go back to the premise that the Russian leaders are rational and logical, and know that in the event of a war they, too, will be destroyed.

Some experts think, therefore, that the Russians are already too late. Right now our S.A.C. aeroplanes apparently have sufficiently retaliatory power. In a matter of a year or so we will have ballistic missiles, small to be sure, but missiles which can be fired from movable bases. The situation appears to be heading for a stalemate since neither side will be able to destroy the retaliatory force of the other.

Now our only job is to convince the Russians that this is so, and that they just haven't a chance in the World ever to cripple our retaliatory power. It is not enough that we know it. In order to be effective we must make sure that they are convinced that these statements are correct. Many strategists believe that this is an approach which can help prevent a nuclear war. But as long as the Russians feel that they have a good chance to knock us out completely with little fear of retaliation, then the possibility of a surprise attack will always be present.

Orbital Communications

By Kenneth Gatland

THERE can be little doubt that the first "practical" outlet for satellite research lies in the sphere of communications. The experiment performed a fortnight ago in which the Moon was used as a communications link between the Jodrell Bank radio-telescope and a receiving centre at Cambridge Air Force Base, Massachusetts, represents an important step forward in this direction.

Use of our natural satellite as a "passive reflector" stems from the time the U.S. Signal Corps obtained the first radar reflection in 1946. Subsequently, this was done from this country and visitors to the 1951 Festival of Britain could listen to the echoes of signals dispatched to the Moon from a directional antenna mounted on top of the Waterloo Shot Tower.

Intelligible Signals

The experiments this month, however, were rather more sophisticated in that they involved the transmission and reception of actual messages. The first such message, in Morse code, read as follows:—

"Jodrell Bank to Air Force Cambridge Research Centre, Massachusetts. We'll have no trouble with fishing boats on this circuit."

This signal referred to an incident in August, 1957, when communications were temporarily disrupted by fishing boats causing breaks in transatlantic underwater cables. Following the Morse experiment, the intelligibility of voice transmission was established.

A joint statement put out by Jodrell Bank and Pye Telecommunications, Ltd. (makers of the transmitting and receiving equipment for the radio-telescope) gave some background information on the experiment. This said:—

> "Experiments at Jodrell Bank on the reflection of radio waves from the Moon which were made some years ago led to the surprising conclusion that it ought to be possible to use the Moon as a reflector of radio waves for long-distance communication. A preliminary demonstration that such reflected signals were in fact intelligible was given by Professor A. C. B. Lovell (Director of Jodrell Bank) during the course of the B.B.C.'s Reith Lectures last autumn.*
>
> "The experiments have now been extended in an effort to establish a radio link via the Moon between the radio telescope at Jodrell Bank and the Air Force research centre at Massachusetts, U.S.A. These investigations have met with the success which was to be expected on the basis of the earlier investigations and a preliminary lunar link has been established during this week.
>
> "A number of scientific measurements have been carried out using various audiotones which will be analysed in due course. . . . The transmitting and receiving equipment used with the telescope was manufactured by Pye Telecommunications, Ltd., who have been quick to appreciate the commercial possibilities of long-distance radio-communication, with freedom from ionospheric fade-out and other disturbances."

*Professor Lovell broadcast a recording he had made of his own voice being reflected from the Moon's surface in which his loud "Hello!" was followed 2½ sec. later by a faint echo.

Commenting on the achievement, Mr. John Brinkley, managing director of Pye Telecommunications, said his company hoped to build a smaller radio telescope with more power and higher frequency with a 25-ft. diameter directional antenna instead of the 250-ft. "bowl" at Jodrell Bank. This, he thought, would make communication via the Moon a truly commercial proposition.

The Moon would take speech and probably music, but it lacked sufficient band-width for television. Moreover, the rough nature of the Moon's surface would cause picture distortion. There were, however, big possibilities ahead in the use of large inflatable artificial satellites which would provide a smooth surface for the reflection of radio waves.

Inflatable Satellites

Use of artificial satellites as "passive" reflectors would also overcome the inherent limitations of the Moon in that it periodically rises and sets. An artificial satellite put into an equatorial orbit some 26,000 miles from the Earth's centre would keep station with a given point on the Earth's surface, matching the planet's axial rotation. This is the so-called 24-hr. orbit which would permit direct "line-of-sight" communications at all times—day or night.

A number of experiments have already been made in the United States in which attempts were made to loft inflatable plastic "balloons" into the upper atmosphere. The first such devices—intended for drag studies—were produced by the National Advisory Committee for Aeronautics for launching from Vanguard rockets.

They were made of plastic material coated with aluminium and had a diameter of 20 in.; since they weighed only a few ounces, it was possible for Vanguard to carry both a 21.5-lb. instrumented satellite and the inflatable satellite into orbit at the same time. Unfortunately, failures with Vanguard never permitted this experiment to be successfully carried out.

However, early in 1957, the NACA had already produced the prototype of a much larger inflatable satellite of 12-ft. diameter made of the same material and covered with aluminium foil. When deflated the outsize satellite could be rolled into a package measuring 4 ft. by 10 in.

Estimates had suggested that this body, if placed in a close-satellite orbit, would appear as bright as the North Star in

reflected sunlight before dawn and after sunset, and that if placed in an orbit around the Moon it could be seen by astronomical telescopes. This 12-ft. satellite was not spherical but consisted of eight segments supported by three tubular rings, giving it the name "corner reflector." At the time, this was regarded as the best shape for reflecting radio signals for tracking purposes.

On October 23 last year, however, an attempt was made to orbit a 12-ft. inflatable sphere weighing 9.26 lb. in a Jupiter-C launching vehicle, but the second stage failed to ignite. The experiment—called Beacon—was designed to provide data on atmospheric density at altitudes up to 400 miles. Recently, the NASA announced plans to launch a 100-ft. inflatable satellite and possibly another 12-ft. model, the former to be used for radio-communication experiments.

"Active" Space Relays

Passive-satellites are not, of course, the only means of relaying signals from space. As early as 1945, Mr. Arthur C. Clarke, a former chairman of the British Interplanetary Society, had suggested that three radio-equipped satellites, spaced 120 degrees apart in an orbit above the equator, could provide World coverage for radio and television.

"This chain of satellite stations," he said, "could not only solve the otherwise apparently intractable problem of world-wide television, but, perhaps more important and of far greater economic importance, it could eventually replace the thousands of radio and telegraph stations, and the millions of miles of cable, comprising our planet's communication system.

A major step towards this goal was realized on December 18 last year when the ARPA launched an Atlas ICBM into orbit. The 8,700-lb. structure of the final stage included 150 lb. of radio equipment—twin packages of radio transmitting, recording and receiving apparatus, each weighing 35 lb. Other components were a battery, a voltage converter, a radio beacon and a control unit.

This was Project Score, and the rocket—85 ft. long by 10 ft. diameter—carried into orbit a goodwill message from President Eisenhower which had previously been tape recorded. This historic recording, transmitted the following day, was the first time that a human voice had been beamed from outer space.

Later, the satellite accepted and relayed messages from ground stations in Texas, Arizona and Georgia.

A month before this experiment was made, Mr. R. Johnson stated that the ARPA hoped to put a 6,000-lb. communications satellite in a "stationary" orbit 22,300 miles from the Earth by 1961 using a cluster of eight Jupiter engines, plus an Atlas, Titan or possibly a Minuteman as second stage. The contract for the launching system, he said, was granted to the ABMA in October, 1958, and at the moment the project was being co-ordinated by the U.S. Army Signal Corps.

These are important developments and it is evident that here is fertile ground for prospective Anglo-American co-operation. It might be profitable if the planners of our space programme pondered carefully the implications of these latest experiments to decide whether or not it would be wise to extend our interests in space research, at an early date, to include this fast-developing field of orbital communications.

Spotting for Lunik

ASTRONOMERS will be able to observe Lunik, the Soviet artificial planet, in five years' time when it will be at its nearest to the Earth, according to Alexander Dadayev, scientific secretary of Pulkovo Observatory. By that time, he says, astronomers will have developed equipment which will make visual observation of the probe possible.

Experiments made with photo-multipliers by Soviet astronomers have already shown that they greatly increase the brightness of astronomical bodies. It is possible, Dadayev claims, to increase the amount of light more than 100 and 150 times without increasing the diameter of the telescope, thereby making it possible to discover objects that would otherwise be invisible.

A similar effect of increased brightness, he says, can be achieved by means of a TV set coupled with a telescope. An experimental TV-telescope designed at Pulkovo Observatory makes it possible to isolate the desired objective against the background of the sky and to reduce observation time approximately 200 times as compared with conventional methods of photography.

Military Research by a Civil Agency?

AN interesting feature of the 44th and final report of NACA, the U.S. National Advisory Committee for Aeronautics, is the full text of the U.S. act setting up its successor NASA, the National Aeronautics and Space Administration.

This makes it clear that although NASA is a civilian agency, one of its objects is to "make available to agencies directly concerned with national defense discoveries that have military value or significance." Another provision of the act states that it is a duty of the President to "provide for effective co-operation between the National Aeronautics and Space Administration and the Dept. of Defense," and to "specify which activities may be carried on concurrently by both such agencies notwithstanding the assignment of primary responsibility therefor to one or other of such agencies."

These clauses suggest that to a large extent the work of NASA will be as closely tied to military research as that of its predecessor, NACA. The NASA man-in-space programme, Project Mercury, clearly has important military implications as well as ones of national prestige; the civil benefits alone could not easily justify the immense spending involved in this programme. But in the United States—as in Britain—it seems politic to "sell" space programmes as being purely civil and scientific in interest rather than military.

Certainly the 44-year career of NACA has been devoted largely to research for military aircraft, which have in turn shown the way for the later development of civil types. This is shown in the NACA report, which includes two fascinating surveys of the agency's work since 1915. In these, NACA's last two chairmen, Jerome C. Hunsaker and James H. Doolittle, trace its history over its first 40 and last four years respectively.

A.W.A.'s "Flutter Dart"

RESEARCH into the problems of supersonic airliners, currently engaging the attention of Sir W. G. Armstrong Whitworth Aircraft, Ltd., has resulted in a rocket test vehicle for investigating wing flutter.

At the International Transistor Exhibition held at Earls Court from May 21-27, visitors were able to examine one of these research models complete with its miniaturized electronics equipment. Called the "Flutter Dart," the A.W.A. test vehicle carries strain gauges, transistor amplifiers and other equipment for measuring movements of the wing and control surfaces at speeds of more than 1,000 m.p.h. Information of the effect of supersonic flight on performance is transmitted to the ground by radio. The vehicle on show had actually been recovered after a test flight on an artillery range.

Electronic equipment of the Armstrong Whitworth "Flutter Dart," referred to above, being checked at the company's Coventry laboratories.

Services for Guided Weapons

ALTHOUGH guided missiles have come to be regarded as complex electronic devices shrouded in security, there is a tendency to overlook the fact that they embody some comparatively straightforward engineering of a kind very familiar to most aeronautical engineers. This fact of missile life is perhaps made manifest by the names of the companies who supply ancillary equipment to the guided weapons industry. There are many whose standard range of products has been adapted or modified to suit the particular requirements of this new market.

Among such companies, well known in the aircraft industry, is Avica whose range of flexible pipes and associated equipment originally intended for airframe and aero-engine application, has proved very amenable to a change of environment. Their products are, in fact, employed in various ways on nearly all the British range of guided weapons or their ground equipment.

Security problems prevent any detailed list being given but the drawing on this page of a hypothetical missile does give an indication of the contribution the company makes in this particular field. For example, their stainless steel flexible tube assemblies can be used for taking fuel and oxidant from the ground equipment to the weapon and also for the internal propellents systems. They are also suitable for internal and external refrigerant lines and as hydraulic or pneumatic pressure feed lines where movement between connected components and flexibility for assembly purposes is required.

These assemblies are available with welded, brazed and mechanically attached end-couplings and range in size from $\frac{1}{16}$-in. i.d. to 4-in. i.d. Working pressures of up to 1,000 p.s.i. can be catered for over a temperature range of −200° C. to +450° C.

Where heat transfer is a particular problem—for example with liquid gases—specially insulated units are provided. The insulation takes the form of lagging with glass wool or glass cloth, or building a tube within a tube and filling the dividing space with a mineral insulant.

When it comes to low-pressure ducting for hot or cold gases, the Flexflyte and Spiratube lightweight ducting is available. This consists of glass fabric impregnated with neoprene or silicone rubber, according to type, and supported by a helix of high tensile steel wire. Flexflyte is available with internal diameters ranging from $\frac{1}{2}$ in. to 8 in. while Spiratube covers the 3 in. to 30 in. range. In addition to their application as hot- or cold-air ducting, these components are also used as conduit for electrical cables to prevent chafing and to provide a measure of thermal insulation.

Where expansion and contraction occurs in such things as liquid gas or fuel lines, exhaust systems and refrigerant services, the movements are usually accommodated with a bellows assembly. Made in stainless steel these are normally designed by Avica to meet specific requirements.

In their small sizes, $\frac{1}{4}$-in. to $\frac{1}{2}$-in. i.d., pressures of up to 500 p.s.i. can be accommodated while in the larger sizes (6-in. to 8-in. i.d.) the maximum pressure is around 150 to 200 p.s.i. Accommodation of these pressures has been made possible by incorporating in the bellows assembly restrictive devices such as external sleeves and tie rods, internal spiders and tie rods, and gimbal restrainers permitting controlled movement.

Hydraulic and pneumatic services are widely used in weapons and in ground equipment For these Avica produce a range of synthetic-rubber wire-braided hose assemblies. These are available in sizes from 5/32-in. i.d. to 2-in. i.d. and suitable for pressures up to 6,000 p.s.i. using hydraulic fluid or 3,000 p.s.i. with air.

These hose assemblies are suitable for high gas pressures. But the company does not recommend their subjection in this case to their normal hydraulic working pressures because of the nature of the synthetic rubber.

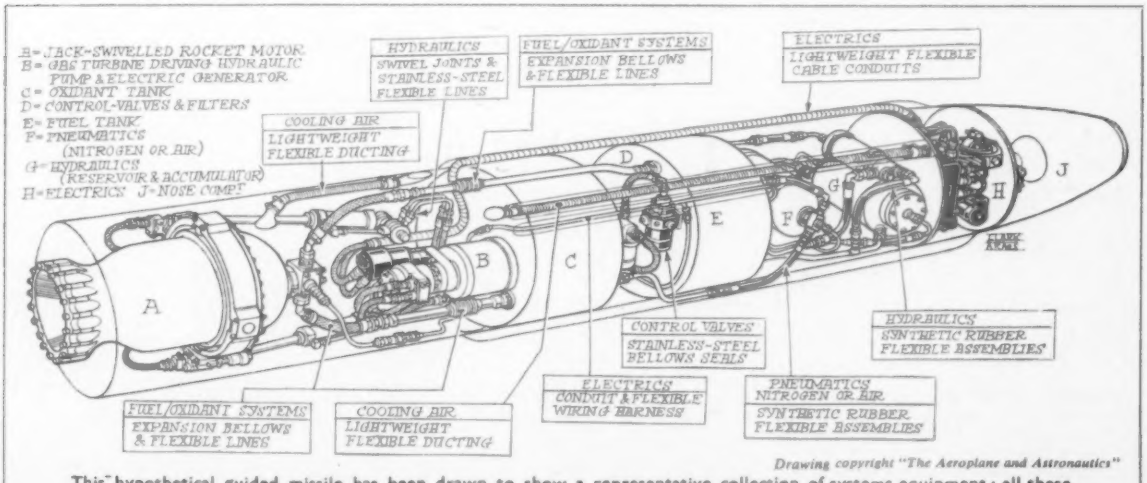
Special couplings for rigid tubes are available for use with tubes from $\frac{3}{8}$-in. o.d. to 6-in. o.d. These are at present used —in the missile field—for pipe runs conveying high-pressure air and nitrogen in plant and test applications and on launching towers. In these units the tube is mechanically expanded into the coupling.

There are many applications in a missile and its ground equipment—particularly for the launching apparatus and radar scanners—where a swivelling point is required in a high-pressure line. These, too, feature in the Avica range and have been designed specifically for hydraulic circuits covering pipe sizes from $\frac{1}{4}$ in. to 1 in. B.S.P. With a working pressure of 4,000 p.s.i. and test pressure of 6,000 p.s.i. they have a maximum test torque loading of 8 lb. in. and a normal loading of 3 lb. in.

These couplings are also suitable for pneumatic systems when the high pressures involved preclude the use of the synthetic flexible rubber hose assemblies. Applications in this direction include air and nitrogen supply lines for charging the missile's systems.

The company plans to extend its range in this sphere by the introduction of the American "On Mark" self-sealing and breakaway couplings. These are said to be suitable for missile and ground equipment services handling all fuels, oxidants and high-pressure gases.

Formed in 1936 for supplying synthetic rubber hose to the aircraft industry, the Avica team over the years has expanded its range and gone into other industries. Four years ago the company moved from London to a new factory at Hemel Hempstead where its various products are assembled. There, 150-strong, it plays a very useful part in providing some essential services for the guided weapons industry.



Drawing copyright "The Aeroplane and Astronautics"

This hypothetical guided missile has been drawn to show a representative collection of systems equipment; all these items would not necessarily be installed in one weapon type.

Astronautics and Missile News

RE-ENTRY. — Laboratory assistants make a plaster cast of the nose of a Thor-Able re-entry body which has survived a 5,000-mile test-firing from Cape Canaveral. The Avco ablating heat-shield partially burnt off as the vehicle plummeted into the atmosphere leaving a fiery trail. The dark substance seen is ablative material which flowed back over the main body as a result of re-entry heating.

POLARIS ABORTS.—A Polaris test-vehicle launched at Cape Canaveral earlier this month descended prematurely into the sea when its second stage failed to ignite.

NOSE-CONE PHOTOGRAPHY.—The first pictures ever taken from a nose-cone after its separation from a ballistic missile in flight were secured on May 12. Pictures show the open nose of a Thor missile just after separation, the vehicle falling farther behind as the nose-cone speeds along its course toward a height of 300 miles. A 16-mm. camera took the pictures—the first at a height of about 125 miles—through a quartz window in a capsule subsequently picked up from the ocean some 1,400 miles from Cape Canaveral.

VANGUARD I. — The Smithsonian Optical Tracking Station at Woomera has successfully photographed the 6.4-in. Vanguard I artificial satellite at the apogee of its orbit, nearly 2,500 miles from Earth.

ROCKETS DOWN UNDER.—On May 20 Mr. A. S. Hulme, Australian Minister of Supply, announced that two sounding rockets designed and built in Australia had been fired to heights of up to 100 miles. They were Long Tom, 27-ft. long and weighing nearly a ton, which reached a speed of 4,000 m.p.h., and Aeolus, 21-ft. long, weight about ½-ton, reaching 3,000 m.p.h. Each had a payload capacity of some 50 lb. Instruments are recovered by parachute, separation of the compartment occurring at about 40 miles.

SPACE SALVAGE.—Ships of the U.S. Navy (Destroyer Flotilla Four) have been conducting early experiments off the Virginia coast with a full-scale research model of the Mercury space-capsule to determine methods of bringing the vehicle aboard ship after it alights. Present plans are that the capsule will come down in the Atlantic following its orbital mission.

ATLAS EXPLODES.—An Atlas ICBM—the second of the operational type to be tested—exploded in flight 60 sec. after being launched from Cape Canaveral on May 18. It was fitted with a pointed experimental nose-cone. The Atlas is due to enter operational service with Strategic Air Command in July.

General Aviation News

REVIVAL.—The Kellett KD-1A Cropmaster (225-h.p. Jacobs L4MA-7) is a revised version of the original aircraft of 1932. Brief details were published in our issue of April 24.

Levy-Shipp photograph

DC-8 ACCIDENT.—One of the six DC-8s in the F.A.A. certification programme was damaged in a hard landing at Edwards Air Force Base on May 14. It was the second DC-8 to fly, a domestic version with JT-4A engines, and had a crew of eight on board, including Douglas and F.A.A. flight personnel. Douglas state, "There was no indication of deficiency in the aeroplane, engines or systems. Because of the number of aircraft available this incident is not expected to delay the certification schedule."

VERTIJET FOR EUROPE. — The Ryan X-13 Vertijet VTOL aircraft is to be taken on a tour of the eastern U.S. and Europe by the Orientation Group, U.S.A.F., from Norton A.F.B., San Bernardino, Calif. Another is to tour the western U.S., Hawaii and other Pacific areas. The delta wings and vertical fins are being modified to make them detachable for transit.

FIREBEE PERFORMANCE. — A Ryan XQ-2C Firebee jet target drone recently reached a height of 59,000 ft. during a test programme at Holloman A.F.B., New Mexico. It made four simulated target runs during a 77.5-min. flight above 50,000 ft. Total flight time was 96.8 min., of which 87.5 min. was powered. In production at the Ryan plant at Torrance, Calif., are the Q-2A for the U.S.A.F. and the KDA-4, which is now operational with the U.S. Pacific and Atlantic fleets. The XKDA-2, with a Fairchild J44-R-26, is not yet in production.

M.H. 250 PROGRESS.—The Max Holste 250 Super Broussard (two 600-h.p. Pratt & Whitney Wasps) began ground tests at Rheims-Courcy on May 11. The first flight is pending.

ATAR TEST.—The SNECMA Atar E3 turbojet of 3,500-kg. thrust recently completed a test-bench ageing test simulating 1,000 hr. of actual operation.

BELLS IN GERMANY.—The Bell Aircraft Corpn., Buffalo, New York, has entered into an agreement with Henschel-Werke, G.m.b.H., of Kassel, West Germany, for joint technical development and manufacturing. The initial activity is to be the marketing in the U.S. by Bell of a product to be made partly by Henschel and partly by a Bell subsidiary.

CLUB AT DERBY.—The Derby Air Centre opened on May 1 and 15 members were quickly enrolled. The manager and C.F.I. is Mr. Dennis Stuart, and Mr. David Ogilvy is now administratively responsible for flying training both at Derby and Elstree. At Derby an Auster Alpha, G-AIBW, is in use; another Auster and a Chipmunk are to be added to the fleet.

U.S. NUCLEAR AIRCRAFT.—Despite recent reports that the U.S. is to build a nuclear aircraft, no go-ahead for its construction has yet been given, although the U.S.A.F. is to continue its development programme for a nuclear-powered bomber. This aircraft will form part of the CAMAL system—the continuously airborne missile launcher and low-level system—which was described in THE AEROPLANE AND ASTRONAUTICS of May 8.

NEW ITALIANS.—Top, the Procaer Picchio F.15 three-seater (160-h.p. Lycoming) made its first flight on May 7. Below, test flights of the two-seat Cobra F.100 from the same company are pending. This type has a Turboméca Marboré II turbojet.

Commercial Aviation Affairs

B.O.A.C. 707 FLIES.—First flight of the first of B.O.A.C.'s fleet of 15 Boeing 707-436s was made on May 20. Powered by four Rolls-Royce Conway 505 by-pass turbojets, the B.O.A.C. Boeings will have standard accommodation for 117 first-class passengers, with alternative arrangements for 174-180 passengers in six-abreast tourist or economy-class seating, or for 66 passengers in four-abreast slumberette seats.

TWO MORE VISCOUNTS.—Vickers have announced the sale of two more Viscounts—one to Misrair of Egypt and the other to the Royal Bank of Canada. The Misrair Viscount is a V.739A, similar to the last two of the airline's fleet of four Viscounts. It will be delivered in a year's time. The Royal Bank of Canada aircraft—a V.793—has already been delivered. The total number of Viscounts sold is now 407—comprising 284 V.700s; 66 V.800s; and 57 V.810s. They are operated by 41 airlines in 33 countries.

EAGLE APPROVALS.—Application for a licence by Eagle Aviation to operate very-low-fare services between London and Hong Kong has been approved by the Hong Kong licensing authority. The Aden authority has approved the inclusion of Aden as a traffic stop on Eagle's proposed services to Hong Kong and to Singapore. The applications were considered by the Air Transport Board in London in April, and the Minister of Transport and Civil Aviation is expected to announce his decision shortly.

EXCHANGE NEWS.—Latest Market Report of the Aircraft Exchange shows that Cubana is offering for sale its two remaining Viscount 755s (one was lost through rebel activity in 1958). Price asked is $800,000 each.

ALOHA F-27s.—First of three Fairchild F-27s for Aloha Airlines of Hawaii was delivered to Honolulu on May 4 after an 11½-hr. flight across the Pacific. Two extra 525-U.S. gallon fuselage tanks were fitted and the weight at take-off from San Francisco was 42,000 lb., 6,000 lb. over the normal figure.

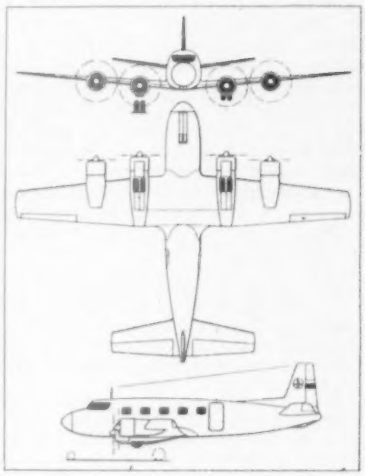
Tu-114 FLIGHT.—On a non-stop passenger flight from Moscow to Khabarovsk on the Manchurian border, the Tu-114 turboprop transport is reported to have covered the 4,250 miles in 8 hr. 42 min. The Tu-114 is reported to be going into service later this year.

JET ATTRACTION.—Between March 20, when they went into service, and April 30, T.W.A.'s 707s have been flown with an average passenger load factor of 95.9%. T.W.A. had, at the beginning of last week, eight 707-131s in service. American Airlines' 707 load factors continue to hover around 95%.

ACCIDENT REPORT.—The C.A.B. accident investigation report dealing with the crash of a Capital Airlines' Viscount on April 6, 1958, at Tri-City Airport, Freeland, indicates that an unanticipated stall occurred while the aircraft was in a steep left turn at an altitude too low to effect recovery. The greatly increased stall speed in a steep turn, an inoperative stall-warning device, and adverse weather conditions, are believed to be the "primary causative factors" relating to the accident.

NEXT WEEK

AMONG the many features in the issue of THE AEROPLANE AND ASTRONAUTICS dated June 5 will be a survey of the achievements of Handley Page, Ltd. This company was founded in 1909 and so is now celebrating its 50th anniversary.



SHORT-HAUL TRANSPORT.—A provisional drawing of the 20-seat Polish MD-12 (four 320-h.p. Narkiewicz WN-3 seven-cylinder engines), the first flight of which is pending. Span, 69 ft. 10½ in.; length, 51 ft. 8½ in.; wing area, 592.02 sq. ft.; gross weight, 16,534 lb.; cruising speed, 177 m.p.h.

News About People

BOEING RESEARCH.—Mr. G. L. Hollingsworth has been appointed director of the scientific research laboratories of the Boeing Airplane Co.

U.S. HELICOPTER PRESIDENT.—On May 8 Mr. R. P. Alex, head of production design components section of Sikorsky Aircraft, was installed as president of the American Helicopter Society.

B.W.P.A. AWARD.—Mrs. Jacqueline Moggridge has been awarded the Jean Lennox Bird Trophy by the British Women Pilots' Association. It was to be presented to her at the R.Ae.S. on May 26 by Lord Brabazon.

PROPELLER POST.—Mr. P. C. F. Morgan has joined the sales department of de Havilland Propellers, Ltd., for special administrative duties. He was until recently managing director of Eagle Aircraft Services and a director of Eagle Aviation, before which he was purchasing manager of B.E.A. He will be concerned with all aspects of D.H. Propeller sales.

Military Aviation Affairs

GANNET AEW.3.—Deck-landing trials of the Fairey Gannet AEW.3 (aircraft XL451) took place in the English Channel earlier this month. The third of the series—the first two preliminary exercises were in November, 1958, and January, 1959—the trials were designed to subject the new radio and radar equipment to intensive deck landings. Three pilots were involved, Fairey test pilot Mr. R. Morris, and two Naval pilots.

AIR/SEA RESCUE.—No. 1101 Marine Craft Unit which was closed down and left Bridlington last October is to be set up there again. To be equipped with two launches, the unit will operate in conjunction with air/sea rescue helicopters of No. 275 Sqn.

NEW EQUIPMENT.—The first Breguet 1050 Alizé for the French Naval Air Force was handed over on May 20.

HUSTLER ORDERS.—Convair has received an $8 million U.S.A.F. contract for long-lead-time items for 40 additional B-58 Hustler supersonic bombers. So far 66 B-58s have been ordered. The first B-58 disposable pod equipped with a dummy nuclear warhead has been dropped on test at Holloman A.F.B., New Mexico.

NAVY DAYS.—The Admiralty has issued six amendments to the previously published list of "At Homes" at R.N. Air Stations. These are Arbroath, June 13; Abbotsinch, June 20; Lossiemouth and Brawdy, July 18; and Yeovilton and Culdrose, July 25.

DINED-OUT.—A guest night in honour of Air Marshal Sir Andrew McKee, who is leaving the R.A.F. on June 13 after 30 years' service, was held recently at Headquarters, Transport Command, Upavon. He handed over the Command to Air Marshal Sir Denis H. F. Barnett on May 16.

A D.H.Ae.T.S. Retirement

FROM Hatfield comes news of the retirement at the end of this month of Sqn. Ldr. R. W. Reeve, D.F.C., A.F.C., M.M., principal of The de Havilland Aeronautical Technical School. With his departure from Astwick Manor the school will lose a leader who will be remembered with affection by thousands of D.H. students and apprentices who have enjoyed the benefit of his wisdom and guidance during their training. Bob Reeve, as he was almost universally known, has been very largely responsible for the remarkable expansion and development of the D.H. Technical School since the early days of the War when he took over as principal.

Born in 1893, he joined the Army in 1914 and, after serving in the Gallipoli campaign, transferred, two years later, to the R.F.C. He learnt to fly in Egypt and was awarded a D.F.C. when serving with No. 113 Squadron.

In 1919 he flew on the Peace Conference communication flights between London and the Continent. From then until 1923 he and a partner operated a joy-riding concern—after which he became a flying instructor at the Beardmore-operated Reserve School at Renfrew.

Sqn. Ldr. Reeve went to de Havilland, then at Stag Lane, in 1925, and four years later became C.F.I. there. The following year he was responsible for the opening of the present aerodrome at Hatfield. From 1935 until he was appointed to the school, Sqn. Ldr. Reeve was C.F.I. of No. 13 E.F.T.S., operated by de Havilland at White Waltham.

Sqn. Ldr. R. W. Reeve (left) and Mr. G. W. Trevelyan.

Mr. G. W. Trevelyan, the company's education manager since 1957, is to take over the former duties of Sqn. Ldr. Reeve. In the announcement of these changes it is stated that since the War, as training responsibility has gradually been assumed by the individual D.H. companies, the Technical School function has become largely one of co-ordination, formulating policy and ensuring uniformity of apprenticeship and trainee terms.

Championship Results from Lasham

AFTER seven consecutive days of flying, the National Gliding Championships ended on Whit-Monday after the two final days in which the task set had to be cancelled because the low strata cloud would not clear off soon enough. However, there was enough soarable weather to justify the British Gliding Association holding the championships in the spring instead of the summer, following the example of several Continental countries.

The organization was better than it has ever been, and task-setting by Mrs. Ann Welch, in consultation with the meteorologists, came as near ideal as can be expected with such a chancy business, the ideal being a task which can be completed by most pilots but not all.

Mr. Geoffrey Stephenson (top) the new British Gliding Champion, and Mr. Philip Wills, both of whom have recently announced their retirement from competition flying.

Mr. Geoffrey Stephenson, of the London Club, celebrated the 20th anniversary of his first crossing of the Channel by becoming British Gliding Champion for the second time, the first occasion being in 1951. He won the Londonderry Cup, £20 cheque, two B.E.A. tickets, a B.G.A. tankard, a flash-lamp and cigars. He flew a Slingsby Skylark 3B.

Other principal trophies and prizes, which were presented to the recipients by the gliding correspondent of THE AEROPLANE AND ASTRONAUTICS at the closing ceremony were:—

L. du Garde Peach Trophy to W. N. Tonkyn and F. G. Irving, for winning the team championship, League I.

Kemsley Cup to the Bristol Club for highest placing by a Club entry—the Skylark 2 flown by A. O. Sutcliffe and J. D. Jones, who also won a **Kronfeld Tankard** for the best score in League II with a 15-m. span; a similar tankard for League I was won by Sgt. John Williamson, R.A.F.

Firth-Vickers Trophy to B. Masters, H. Mettam and Mrs. R. Harwood for winning League II team championship.

Furlong Trophy to the individual championship winner in League II, R. C. Stafford-Allen of the London Club, who also won the **EoN Cup** for the best performance in an Olympia. This was, after all, according to the terms of the award, the type with the largest representation, as Philip Wills took a Skylark 3 to Holland before the meeting ended.

Slingsby Trophy to D. M. Kaye of the Derbyshire and Lancashire Club, for highest placing with an Eagle sailplane, that being the two-seat type most largely represented.

Pan American Trophy for highest score in a Service-owned sailplane to Ft. Lt. G. A. Coatesworth of 2nd T.A.F. Gliding and Soaring Association in Germany, who also won the **Crown Agents Prize** for the best pilot without previous championship experience.

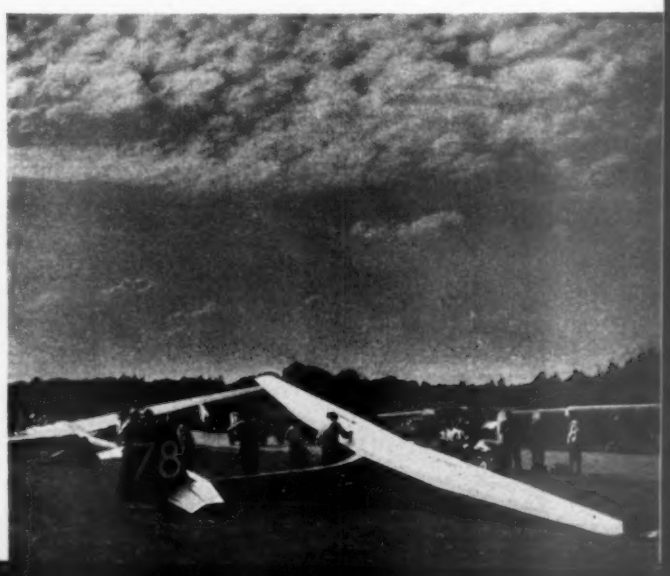
Among other prizes was a subscription to THE AEROPLANE AND ASTRONAUTICS for A. H. Baynes, K. W. Blake and J. B. Jefferson of the Derbyshire and Lancashire Club for gaining fourth place in League II.

Leading final scores—League I: G. H. Stephenson, 490; H. C. N. Goodhart, 475; D. H. G. Ince, 452; W. N. Tonkyn and F. G. Irving, 438; Anne Burns and D. Marttlew, 411; G. E. Burton, 404.

League II: Mrs. R. Harwood, B. Masters and H. Mettam, 464; A. O. Sutcliffe and J. D. Jones, 355; R. C. Stafford-Allen, 346.

Inter-Service Championships—Individual Contests: First, Cdr. H. C. N. Goodhart, R.N.; second, Sgt. A. Gough, R.A.F.; third, Sgt. J. Williamson, R.A.F.; fourth, Lt.-Col. A. J. Deane-Drummond, Army.

Team Contest for highest aggregate score by three best entries: R.A.F., 1,063; R.N., 1,024; Army, 703.



The general scene at Lasham towards the beginning of the Championships. A photograph of all the winners appeared in our issue last week.

Photograph copyright "The Aeroplane and Astronautics"

Correspondence

An Open Letter to the Space Committee

A NUMBER of years ago a very foolish person suggested that ships should be made of iron.

Some well-informed people showed how ridiculous the idea was by pointing out what everybody knew—that iron did not float, and nor would ships of the same material.

However, Great Britain upheld her right to the prefix of "Great," mainly due to the endeavour of her Navy, the men who designed her iron ships and the men who sailed them. I am afraid to contemplate the sorry state of this country if, during that crucial period, the advocates of iron ships had not eventually overcome opposition.

Today we face a parallel situation, except that the lack of official interest in this case is not in sea ships, but space ships and fighting vehicles of that nature.

In the East and the West two giants are arising and girding their loins for the next fight. The nature of the weapons they will use and that of the ship to carry them is emerging. Both sides are attacking the problem with an energy and dedication that can only be matched by Great Britain in her ascendancy. When the two giants eventually join in battle little Britain will be squeezed out of existence between these forces.

During recent years certain trends have led me to believe that future historians may write about this post-War period in terms of the decline and fall of Great Britain.

I would like to remind you that the capability of a nation in any engineering field is the result of an accumulation of small skills and experiences by large numbers of companies who, sponsored either by commercial demand or Government requirements, apply themselves for a number of years to a specialized field.

In short, a nation's capability is the result of long and intense effort and cannot be acquired second-hand.

For these reasons, gentlemen, I implore you to consider the frightening inadequacy of the proposed space operation.

If you still consider the financial burden too great, then at least divert all or half the fifty million pounds earmarked for the new Queen ships to this most important project.

Let your aim be to turn the sea shipyards into space shipyards within 30 years.

Welwyn Garden City, Herts. W. WOODS-HILL.

The Rights of the Pilot

I THINK Mr. Ayers (THE AEROPLANE AND ASTRONAUTICS, May 15) is under-estimating the Minister's powers. As I interpret it, the Air Navigation Order gives the Minister the power to cancel or suspend any licence if after investigation (by the Minister) he is satisfied that there are sufficient grounds. Furthermore, he may, without reason given or investigation, require the holder of, say, an Airline Transport Pilot's Licence to re-sit and pass all the written examinations and flying tests for the grant of this licence at each six-monthly renewal.

The Minister may also refuse to renew a licence should he consider such expedient in the public interest. As the law now stands a pilot may be deprived of his very livelihood without independent inquiry, representation, or any legal redress.

This, not a fine and imprisonment, appears to be the maximum penalty. It is high time the position were adjusted to conform to the British standards of justice which many pilots played so prominent a part in fighting for.

Shoreham-by-Sea, Sussex. J. V. STEDMAN.

Boeing 707 Characteristics

IN your April 17 issue, an article appeared describing a 707 dive incident of February 3. In this article you state that, under the conditions in which this flight was conducted, the aircraft was close to the "coffin corner" and quoted some B-47 experience with this phenomenon. The statement was also made that the B-47 has the same basic wing as the 707.

If you will pardon my presumption, these facts or suppositions are quite at variance with the information available to me upon these aircraft and do not reflect careful attention to detail on the part of your correspondent.

The B-47 and the 707 have radically different wings—both in area, aspect ratio and thickness distribution. They are in no way interrelated and numbers applicable to the B-47 are in no way applicable to the 707. The "coffin corner" phenomenon does not occur in the 707 in practice and at the condition under which this flight was being conducted there was ample margin of speed between the high-speed and the low-speed buffet to account for any reasonable manœuvring.

The equivalent airspeeds at which the buffet occurs, according to the operation manual of this aircraft, for a 1*g* and a 2*g* condition are given in the following table:—

	Initial Buffet Speeds	
	High Speed	*Low Speed*
1*g*	282 kt.	165 kt.
2*g*	273 kt.	203 kt.

On page 452 of the same issue, a Comet incident, wherein a tyre blew up in the wheel well, was described. Again, you could not refrain from mentioning the 707 and its development troubles and you inferred that such an incident occurred on the Boeing aircraft at 22,000 ft. To the best of my knowledge, no such incident has occurred although two incidents, involving tyres bursting after take-off, have been reported.

La Guardia Airport Station, Flushing 71, New York. F. W. KOLK, Director, Equipment Research, American Airlines.

[We are grateful to Mr. Kolk for the details he gives of Boeing 707 characteristics—details which, so far as we are aware, have not previously been made available. It would be interesting to know the weight and temperature to which the buffet speeds apply. The tyre-bursting incident in the 707 prototype to which we referred was described by Mr. "Tex" Johnston, Boeing's chief of flight test, in an I.A.S. paper in 1956, when he said that several tyres caught fire and blew out at 22,000 ft. as a result of overheated brakes.—ED.]

Groundabout

O Delectable Decca. The patriot and writer in me compels me to quote from a glowing appraisal, in *Skyways*, of Decca, by Mr. W. K. Lawton, Executive Director of the (American) National Business Aircraft Assn. "This," says Mr. Lawton, after he had been "exposed" to a Comet demonstration of the British achievement, "is IT!" He goes on: "It is fantastic! It's like your first ride in an automobile after years of pedalling a bicycle—the first American girl you saw after four years in the Pacific—a suite at the Waldorf compared to a room at the Y. And like all three, it's costly, beautiful and luxurious." But then, after quoting $1,200 for the airborne unit and $562,500 per Decca chain installation, he says, "For what the Decca system gives, this could be a bargain price." In a transport of delight, he quotes O. Khayyám: "The moving finger writes and, having writ, moves on. Nor all your piety or wit shall lure it back to cancel half a line." Decca the Mecca?

*

A Meal Called Charlie. A T.A.A. captain, reporting on a meal served to him at a country halt, said: "I was given the smallest steak I have ever seen. I ate it in three mouthfuls, likewise my First Officer."

*

From My Favourite Line Book

The crews for the S.A.C. Bombing Competition were to be based near Hollywood. Someone wondered what "jabs" would be needed.

Wingco: "Starlet fever."

*

"Good heavens, Sir—that tie! it will *ruin* the décor!"

by Gremlin

NOTES AND EVENTS

GETTING GOING.—This Blackburn mobile starter has been used at London Airport recently for starting Pan American Airways' Boeing 707s. It incorporates a Palouste engine.

FERRANTI COMPUTER.—A transistorized desk-size electronic digital computer, designed to fill the gap in the small general-purpose computer field, is being manufactured by Ferranti, Ltd. Known as Sirius, it will cost £15,000 and the first production models will be available this autumn.

CUTTING MATERIAL.—A film on the manufacture of Cutanit Cemented Carbides and the performance of this material in a wide variety of machining and wear-resisting applications has been produced by Jessop-Saville, Ltd. A 16-mm. sound film in Kodachrome, it has a running time of 25 min. and is available on free loan from the company's publicity department at Sheffield.

AERONAUTICAL RESEARCH.—An order has recently been placed by de Havilland Propellers, Ltd., with E.M.I. Electronics, Ltd., for an Emiac II computer as an additional aid to research into guided missiles and other problems associated with high-speed flight. The installation will consist of 22 modules and will cost £52,000. First units of another Emiac installation, costing over £55,000, were recently dispatched from Hayes to the Whitley factory of Sir W. G. Armstrong Whitworth Aircraft, Ltd., and the Australian Government Aircraft Factory, Melbourne, has ordered an Emiac computer for work in connection with its missile programme.

SCHOOL CLOSING.—The de Havilland Technical School at Christchurch is closing for economic reasons.

THORN DEVELOPMENT.—A new five-terminal illuminated press switch is announced by the Aircraft Components Division of Thorn Electrical Industries, Ltd. This compact switch uses the Atlas midget panel lamp, and the incorporation of the five-terminal arrangement allows it to be supplied in 34 circuit variations. Three different caps can be used for indicating and dimming purposes and each is available in a wide range of colours. The units are vibration proof, maintain predetermined contact pressures and can be supplied for 6-, 12- and 28-V. circuits.

ENGINE LUBRICATION.—Mr. J. Hancock, divisional manager of the Castrol Aviation Department, is on a tour of the U.S. and Canada to discuss new Castrol developments in the field of synthetic gas-turbine lubricants with leading aircraft-engine manufacturers.

IMPROVING NAVIGATION.—Hunting Aerosurveys, Ltd., has installed a Marconi Doppler Navigator system in its survey aircraft. The equipment has already been employed in an 18,000-mile oil-exploration survey in the Belgian Congo.

Company Notices

NEW COMPANY

East Yorkshire Aero Club, Ltd. (627,729).—Private co. Reg. May 8. Cap. £100 in £1 shs. Objects: To establish, own, maintain and conduct the East Yorkshire Aero Club, etc. Subscribers (each with one sh.): Albert N. Medforth, "Hazelmere," 27 Clifford St., Hornsea, E. Yorks. Michael R. Heathcote, Felstead, Wheldrake, nr. York. Albert N. Medforth is first director. Sec.: R. M. Heathcote. Solr.: P. F. Bilton, 22 Parliament St., Hull. Reg. off.: Imperial Chambers, Bowalley Lane, Hull.

CHANGE OF NAME

Racal Aerotronics, Ltd. (501,054), Western Rd., Bracknell, Berks. Name changed to Racal Instruments, Ltd., on Feb. 11, 1959.

INCREASE OF CAPITAL

Orion Airways, Ltd. (560-517), 45 High St., Ringwood, Hants. Increased by £4,000 in £1 ord. shs., beyond reg. cap. of £12,000.

Personal Notices

BIRTHS

Date.—On May 8, at Fontainebleau, to Pamela (*née* Drake), wife of Sqn. Ldr. Philip Date, R.A.F.—a daughter.

Devey Smith.—On May 9, at R.A.F. Hospital, Wegberg, to Wendy (*née* Simonson) wife of Flt. Lt. T. W. Devey Smith—a son.

Dodgson.—On May 6, at Barmouth, Merioneth, to Audrey, wife of Flt. Lt. H. J. Dodgson—a daughter.

Fothergill.—On May 12, at R.A.F. Hospital, Wegberg, to Joan, wife of Sqn. Ldr. W. T. Fothergill, M.B., B.S.—a daughter.

Highton.—On May 13, at R.A.F. Hospital, Ely, to Mary (*née* Fuller), wife of Flg. Off. P. I. Highton—a son.

Jones.—On May 9, at Coltishall Nursing Home, to Josephine (*née* Weaver), wife of Flt. Lt. Brian Jones—a son.

McCulloch.—On May 14, at Whittington Hospital, Highgate, to Philomena (*née* Flynn), wife of Flt. Lt. A. G. S. McCulloch, R.A.F. (Retd.)—a son.

O'Brien.—On May 6, at R.A.F. Hospital, Wegberg, to Jo (*née* Sign), wife of Flt. Lt. F. D. O'Brien, R.A.F.—a son.

Pearce.—On May 11, at R.A.F. Hospital, Ely, to Joan (*née* Baldwin), wife of Sqn. Ldr. Drake Pearce—a son.

Short.—On May 2, at R.A.F. Changi, Singapore, to Margaret (*née* Baron), wife of Sqn. Ldr. F. R. Short—a son.

Timlett.—On April 30, at Singapore, to Muriel (*née* Anderson), wife of Flt. Lt. R. J. Timlett, R.A.F.—twin son and daughter.

DEATHS

Brooke.—On May 11, 1959, at Royal Victoria Hospital, Boscombe, Gp. Capt. Kennedy Gerard Brooke, C.M.G.

Underhill.—On May 16, Rev. Wilfred Underhill, D.S.C., Gp. Capt. R.A.F. (Retd.), Rector of Rusper.

Aviation Calendar

May 30-31.—Sixth Dauphine Aéro Club rally, at **Grenoble,** France.

May 30-June 1.—Rally of the Moselle Wines, organized by Aéro-Sport, in **Luxembourg.**

May 30-June 6.—R.A.F.A. Air Week, at **Brighton.** (Air display at Shoreham Airport, May 30.)

May 30-June 7.—Huit Jours d'Angers international gliding competition, organized by Aéro-Club de L'Ouest de la France, at **Angers.**

June 5.—Helic. Assn. of Gt. Britain lecture, "Some Design Aspects of Tandem-rotor Helicopters," by J. D. Sibley and C. H. Jones (Bristol Aircraft), in the R.Ae.S. library, 4 Hamilton Place, **London,** W.1, at 18.00 hrs.

June 5-7.—Air display organized by Skegness Ae.C., at **Skegness aerodrome,** Lincs.

June 6.—Fourth helicopter rally and garden party organized by Helic. Assn. of Gt. Britain, at Dunsborough Park, **Ripley,** Surrey.

June 6.—Popular Flying Association A.G.M. and party, at the Kronfeld Club, 74 Eccleston Square, **London,** S.W.1, at 16.30 hrs.

June 6-7.—Air rally organized by Florence Ae.C., **Florence,** Italy.

June 6-8.—International air rally organized by Zoute Aviation Club, at **Le Zoute,** Belgium.

June 7.—International free balloon contest, organized by R. Dutch Ae.C., at **Etten-Leur,** near Rosendaal, Holland.

June 9.—Aircraft Ice Protection Conference, organized by D. Napier and Son, Ltd., and R.Ae.S., at **Luton Airport,** Beds. (all day).

June 12-21.—23rd French Aeronautical Air Show at Le Bourget Airport, **Paris.**

June 13-14.—Tiger Club aerobatic competition and race meeting at **Stapleford Tawney aerodrome,** Essex.

June 13-14.—11th Rally of Lower Normandy, organized by Flers Aero Club, at **Flers.**

June 13-14.—Air rally organized by Glamorgan Flying Club, at **Rhoose,** Cardiff.

June 15.—R.Ae.S. Halton Branch lecture, at the Branch H.Q., R.A.F. **Halton,** at 18.45 hrs.

June 17-20.—Parachuting contests organized by Fliegertrupper Leutkirch e.V., at Leutkirch Unterzeil aerodrome, **Germany.**

June 17-21.—Air Tour of Europe organized by F.A.I., **Rotterdam,** Holland.

June 26-29.—11th Air Tour of Sicily, organized by Palermo Aero Club, **Palermo.**

June 27-28.—Aix les Bains rally, organized by Savoy Ae.C., **France.**

June 27-29.—R.Ae.C. invitation air rally, at **La Baule,** near St. Nazaire, France.

Publications Received

ALL ABOUT MODEL AIRCRAFT. By P. G. F. Chinn. 106 pp., 7¼ in. by 9¼ in. Illustrated. Percival Marshall and Co., Ltd. Price 6s.

HELICOPTER DYNAMICS AND AERODYNAMICS. By P. R. Payne. 442 pp., 6¼ in. by 10 in. Illustrated. Sir Isaac Pitman and Sons, Ltd. Price 84s.

THE BOMBER'S EYE. By Dudley Saward. 265 pp., 5½ in. by 8¼ in. Illustrated. Cassell and Co., Ltd. Price 21s.

THE IMPACT OF AIR POWER. Edited by Eugene M. Emme. 914 pp., 5¼ in. by 8¼ in. D. Van Nostrand Co., Ltd. Price 79s. 6d.

THEORETICAL AERODYNAMICS (3rd Edition). By L. M. Milne-Thomson. 414 pp., 6¼ in. by 10 in. Illustrated. Macmillan and Co., Ltd. Price 40s.

THE SOVIET AIR AND ROCKET FORCES. Edited by Asher Lee. 311 pp., 5¼ in. by 8¼ in. Illustrated. Weidenfeld and Nicholson, Ltd. Price 36s.

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NOTICES

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THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM HUNTING-CLAN AIR TRANSPORT, LTD., OF LONDON AIRPORT, HOUNSLOW, MIDDLESEX:—

APPLICATION NO. 18/6 for an amendment to the terms of approval of the Coach Class Service which they are authorized to operate with Viscount aircraft on the route London-Rome-Benina-Wadi Halfa or Luxor-Khartoum-Entebbe-N'Dola-Lusaka-Salisbury at a frequency of two return flights each 28 days until October 31, 1967, so as to enable them to operate an additional 10 flights per annum during the period from March to October each year with the proviso that not more than four return flights should be operated in any 28-day period.

APPLICATION NO. 84/3 for an amendment to the terms of approval of the Coach Class Service which they are authorized to operate with Viscount aircraft on the route London-Rome-Athens or Benina-Cairo or Wadi Halfa or Luxor-Khartoum-Entebbe-Nairobi, at a frequency of up to four return flights each 28 days until October 31, 1967, so as to enable them to operate at a frequency of from two to six return flights each 28 days within a total of 52 return flights annually.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 491-2

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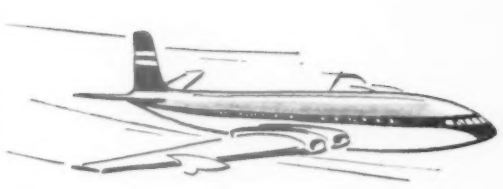

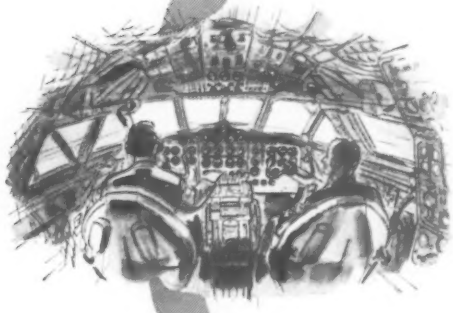

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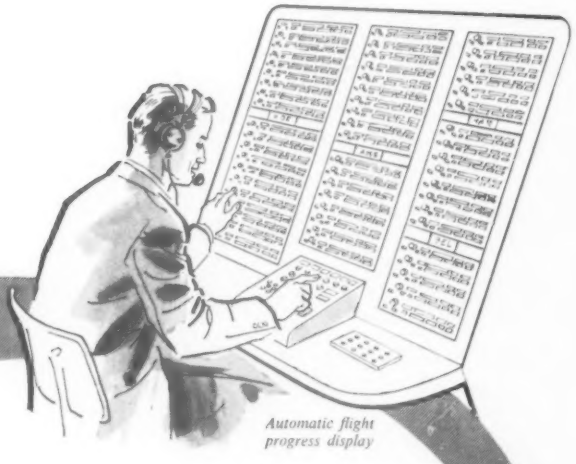
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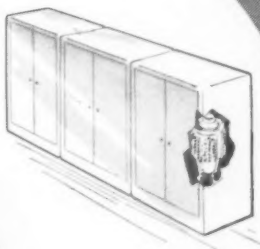

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